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ABSTRACT

The Arizona Educational and Informational Telecommunications Cooperative (AEITC) hosted the Arizona Telecommunications Issues and Policy Symposium in order to provide a forum for telecommunications discussions, planning, and cooperation; bring together Arizona telecommunications leaders from the education, industrial, military, government, and library communities to recommend steps for an action plan to move Arizona into the 21st century; provide a glimpse of existing telecommunications activities; and present a forum for telecommunications leaders to become more familiar with AEITC. The findings of the symposium are organized into four strands: education; business and industry; government and military; and community organizations. In each strand, the perspectives of the area are discussed and directives are presented. The following eight issues were identified as critical to the success of Arizona in the future telecommunications landscape: cooperation; public/private partnerships; marketing; applications; education, training, and retraining; regulatory, legal, and legislative issues; technology; and funding. Included in the appendixes are the symposium program; selected excerpts from conference presentations; and excerpts from "State Plan for a Technology Integrated Educational Delivery System (TIEDS)." (JLB)

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ARIZONA: The State of Telecommunications for the 21st Century

The Proceedings and Findings of

The Arizona Telecommunications Issues and Policy Symposium

September 29, 30 and October 1, 1993

Arizona Educational and
Informational Telecommunications
Cooperative

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Arizona:

The State of Telecommunications for the 21st Century

To deny Arizona's citizens access to information is to deny them their futures. Information is, indeed, power. It is the wealth of society and of its people. Failure to provide all Arizonans access to all sources of information is to confine them to a future without prospect.

Editor: Janelle E. O'Dell
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Arizona: The State of Telecommunications for the 21st Century

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I. Executive Summary

Welcome to the Twenty-First Century!

The Arizona Educational and Informational Telecommunications Cooperative (AEITC) hosted The Arizona Telecommunications Issues and Policy Symposium on September 29, 30, and October 1, 1993. More than 100 telecommunications leaders from across Arizona were assembled. Collectively, they are known as the Telecom*100. Public and private educational institutions, business, industry, local and state government agencies, libraries, and civic organizations were represented.

The goals of the symposium were to:

- Host an open forum for telecommunications discussions, planning and cooperation,
- Bring together Arizona telecommunications leaders from education, business, industry, government, military, libraries, and civic organizations to recommend steps for a comprehensive, cooperative action plan for moving Arizona into the Twenty-First Century,
- Provide a glimpse of a few of the many telecommunications activities in Arizona and across the United States, and
- Present a forum for telecommunications leaders to become more familiar with AEITC.

This document constitutes the findings and proceedings of the symposium, along with an analysis and cooperative writing effort of twenty telecommunication leaders in Arizona.

The critical telecommunications issues which were raised by the Telecom*100 and must be addressed by the State of Arizona are summarized in the following points:

- Support a statewide organization which encourages and advances cooperative planning and development of telecommunications among education, business, industry, government, military, libraries, civic organizations and individuals in the State of Arizona.

- Plan and support public/private partnerships to develop and implement the cost-effective, technically-sound, far-reaching information technology solutions necessary to meet tomorrow's applications and information needs.

- Develop and implement a marketing and education program to increase awareness and acceptance of telecommunications applications and technologies in order to provide minimum universal access, without regard to geography, culture, economics, or disability; to inform all sectors of society of the benefits of common accessible networks; to promote lifelong learning through the use of technology; to promote the use of currently available telecommunications systems; and to adopt telecommunications as a vital and indispensable resource for the citizens of Arizona.

- Meet the current and future needs of the citizens of Arizona with high quality, reasonably priced programs, products, and services which are produced or acquired for delivery via telecommunications.

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- Develop and implement a statewide education, training, and retraining program which will promote lifelong learning through the use of technology; establish a training and education curriculum from secondary to post-doctoral levels for telecommunications/ information management; inform and educate public and private sectors of the benefits of common accessible networks; and develop a telecommunications methodology to eradicate illiteracy.

- Establish and protect a regulatory and legal environment which progressively situates the State of Arizona to balance public and private needs, open competition, public/private roles, service equality, and accessibility to a statewide "commercial strength" information infrastructure.

- Embrace, develop, use, link and evolve all advanced telecommunications technology in order to provide a ubiquitous information infrastructure with universal access to education and information by the citizens of Arizona, without regard to geography, culture, economics, or disability.

- Secure immediate and perpetual funding from federal, state, local, and private sources sufficient to establish an Arizona information infrastructure and to support minimum universal access to education and information via that information infrastructure by every citizen of the State of Arizona.

The Telecom*100 recommended AEITC carry these recommendations forward to federal, state, county, and local agencies and provide coordination among them. No one piece of this telecommunications mosaic gives a clear picture of what is in store for Arizona and its citizens in the Twenty-First Century. No piece can be left out without distorting the final picture!

The details provided in this document constitute the telecommunications roadmap for taking the next progressive steps...into the Twenty-First Century.

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II. Education Strand Perspective

Participants in the Education Strand included individuals from public and private education enterprises and represented every level of education and training: pre-kindergarten to high school, community college, adult basic and continuing education and training, vocational technological education and training, and university.

The participants' discussions centered around four major issues: 1) parity and ubiquity, 2) design standards, 3) educational benefits and applications, and 4) cost and source of funding.

The issue of parity and ubiquity was paramount during the three days of discussion. A telecommunications network must provide all students and educators equitable access and comparable opportunities to teach and learn regardless of the geographic location, culture, ability or resource limitations. A needs analysis, as defined by the users, should be conducted as soon as possible. The purpose of the needs analysis would be to identify the common informational and educational needs of all Arizona residents. The needs analysis should be conducted collaboratively by AEITC in conjunction with other organizations having similar goals.

Of major concern to the participants was the need for telecommunications network standards. The network must be a living design, one that is based on open international standards. The network must provide for the transmission of voice, data, image and video. It must support Arizona's legacy systems and be based on a scalable architecture. The network should have sufficient bandwidth to provide a growth path for adding new users and enhanced services over time. The application of technologies must be consistent.

The issue of the educational benefits and applications of a statewide telecommunications network was critical in the minds of the participants. Schools should become the central focus of the community with educational and informational services available to its stakeholders. Technology and telecommunications have the potential of creating world class educational opportunities. The classroom will no longer be campus bound. Research should be conducted to identify successful programs. Hardware and software should be evaluated and field trials implemented to determine how the learning and teaching processes are affected. The social and psychological impacts of technology and telecommunications, or the lack thereof, should be determined. The group also recognized that classroom technologies have an enormous potential for changing the teaching and learning environment.

A statewide telecommunications network for educational and informational purposes poses a challenge for the state of Arizona - cost and funding. These two issues are directly related to the issues of parity and ubiquity, equity and equality, rural verses urban. To date, the state has not set aside monies nor developed a statewide initiative to invest in a telecommunications infrastructure.

The state must develop a strategic plan for the implementation of a statewide telecommunications network. Funds to design and install the network and to design, develop and deliver applications and training on the network must be made available if the state is to be a significant educational contender in the 21st century. Funds can come from both public and private sources. The state should establish a central buying authority to keep costs down and seek to maximize its resources by adhering to established telecommunications and technologies standards. Partnerships should be established between entities having the same telecommunications needs and services.

Additional discussion dealt with regulatory, management and operational issues relating to a statewide telecommunications network. A Network Information Center (NIC) needs to be identified.

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III. Education Directives

These directives were developed during two days of deliberations by the Education Strand of the Telecom*100. The names of those involved in developing these directives may be found in Appendix B. The content has been reformatted for readability, but otherwise is unedited.

A. Design Standards

1. Concerned with Open International Standards
2. Definition of Interfaces
3. Support for Legacy Systems (those systems currently in place)
4. Interface for Private Entry Exit Forces
5. Scalable Architecture
6. State Contract out (AEITC) with Authority & Responsibility

B. Identify, Recommend, and provide training for applications that benefit education.

1. Recommended Solution(s):
   a. Research successful programs
   b. Evaluate hardware and software
   c. Field trials
   d. Disseminate information
   e. Sponsor training
2. Recommended Implementation Organizations:
   AEA - AEITC - AEMA - ASLA
   AASA - MORRISON INSTITUTE (ASU)
   State Department of Education - Universities and others
3. Timeline:
   On going, ASAP
4. Evaluation:
   Continuous

C. Parity: Comparable opportunity as comparability relates to geography, culture, economics, Disability

1. Recommended Solution(s):
   a. Establish needs analysis as defined by users
   b. Identify basic package of information services available to all Arizona residence
2. Recommended Implementation Organizations:
   AEITC in conjunction with constitution information service
3. Supporting Mechanism:
   a. Standards as established in A. (above)
   b. Other organizations that will provide input and implementation.
4. Timeline:
   Need as soon as possible, as much as possible, because every day kids are losing out
5. Evaluation:
   a. Identify immediate funding sources for AEITC
   b. Follow up on survey with all kids that were involved in the process

D. Cost/Funding:

1. Need to develop a Strategic Plan
2. Within AEITC setup 501C3 to select dollars from both foundations, etc. and promote "the plan"
3. Not to rely on state for monies
4. Recommended Implementation Organizations:
   a. AEITC and subse
   b. AEMA
5. Timeline:
   Plan for Strategic Plan in 94 AEITC meeting

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IV. Business and Industry Strand Perspective

A key to solving the current and future needs of Arizona is the creation of a supportive climate for telecommunication enterprises. Telecommunication technologies can spur economic development. The owners of small businesses are becoming aware that informational access is primary to the continued growth and development of their enterprises. Technology levels the playing field and affords small businesses the opportunity to "play with the big boys."

Challenges, however, do exist. The Business and Industry Strand recognizes that there are obstacles to the creation of a supportive climate of informational equity. The regulatory system for telecommunications was developed at a time in which today's systems were only a Buck Rogers' dream. The system needs to be modernized to support current and future environments. A cohesive statewide telecommunication initiative does not exist, and there is a proliferation of isolated networks. Many of our elected officials and business leaders do not understand the value of network information services. Even the term *telecommunication* is often misunderstood.

Public and private roles, open competition and service equality are some of the issues that need to be addressed in the proposed revision of state regulatory systems. It was felt by the participants of the strand that, in order to create a climate within Arizona that would encourage telecommunication, all aspects of current regulatory system need examination. Policies and practices need to be formally reviewed and revised, where necessary, to ensure Arizona remains nationally competitive. The current and future needs of telecommunications in the state are dependent on cooperative efforts of all stakeholders.

Arizona needs a forum in which issues of security, privacy, standards and accessibility to a statewide "commercial strength" network would be addressed. The creation of a formal policy group would provide a single point of focus and the linkage of various telecommunication organizations. This policy group would be empowered to create an environment for linking various existing networks. This goal would be accomplished through a process of inventorying collective requirements, setting standards to make linkages possible, developing strategic alliances and leveraging vendors to develop communication solutions. The recognition of a formal policy group would provide a locus for dissemination of information and lobbying efforts.

An ongoing and organized statewide telecommunication's literacy campaign needs to be implemented. Many elected officials and business leaders do not understand the value of network information services. A marketing strategy needs to be developed. Existing public forums, such as the Arizona Town Hall, should be used to focus public attention on communication issues. Directories of network services, funding sources and stakeholders need to be developed and disseminated. Educational programs for information management need to be kept current with business needs. A cooperative effort between education, business and government sectors is necessary to raise the level of understanding and literacy concerning telecommunication development strategies.

Technology offers many social and economic as well as educational benefits. Equal access to information is a long range goal that demands long range solutions. Legislators as well as the citizenry will have to be made aware of the small successes on the road to equal access. Information literacy will be a major issue in the Twenty-First Century.

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V. Business and Industry Directives

These directives were developed during two days of deliberations by the Business and Industry Strand of the Telecom*100. The names of those involved in developing these directives may be found in Appendix B. The content has been reformatted for readability, but otherwise is unedited.

A. Regulatory System needs revision to address open competition, public private roles, service equality

1. Recommended Solution(s):
   a. Analysis of requirements
   b. Collective needs (Telecom organizations, TCA, AEITC, and vendors)
   c. Modernize Regulatory System to address current and future needs for telecom within the state of Arizona.
   d. Encourage and incentivize open competition to invest in baseline technology

B. Requirement for Statewide Commercial Strength networks services, avoid proliferation of isolated networks

1. Recommended Solution(s):
   a. Form a formal policy group, to consist of all stakeholders, to provide a single point of focus and linkage to other telecommunications organizations to perform following:
      1. Define reporting authority of the policy group
      2. Inventory collective requirements
      3. Standards setting
      4. Develop strategic alliances
      5. Define benefits
   b. Leverage vendors to develop communications solutions
   c. Create environment for a statewide commercial multimedia telecom network

C. Legal and Security Issues to address: Security, Privacy, Standards, Liability, and Accessibility

1. Recommended Solution(s):
   a. Identify the issues, i.e.
      - electronic signatures
      - data integrity
      - data originality

D. Need to inform and educate public and private sectors of the benefits of common accessible networks

1. Recommended Solution(s):
   a. Publicize the communications issues:
      1. Marketing strategy
      2. Public forums
      3. Lobbying
      4. Directories
      5. Other forums for discussion, i.e. Arizona Town Hall, Economic Development Councils
   b. Involve small business associations and Chambers of Commerce in Policy Group.
   c. Publicize the benefits, i.e. information dissemination.

VI. Government and Military Strand Perspective

All participants of the government and military strand want a positive change in state government. Call it "Reinventing Government" or re-engineering, but most discussions touched upon areas of improved communications, effective planning, evaluating, understanding the needs and characteristics of each agency, setting the example, and sharing leadership.

Leadership is the key to success and should be active, exert effort and influence, and be results oriented. Disciplines should be in place to influence the activities of individuals or groups towards achieving statewide goals and objectives.

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After three days of discussions, five main themes were developed as a result of exploring all issues pertaining to improvements in government. They are 1) education, awareness and marketing; 2) public and private support; 3) cooperative efforts with what we already know and have; 4) funding; and, 5) applications.

One of the major issues in this area is that the right hand knows not what the other hand is doing. In this case, visibility of other agencies and their strategies is either non-existent or not communicated very well. Public education and marketing programs to increase awareness and acceptance of government actions and technologies in order to improve public perception of government are necessary.

Governmental strategies and planning, agency business plans, information resource management (IRM) strategies and telecommunication strategies don't appear to reflect a statewide effort other than being self-serving. Recently, however, there has been an effort to organize the Chief Information Officers (CIO) of various state agencies to develop strategic plans at the state level. It is imperative that key agency CIO's stay involved with statewide strategies and goals in supporting purpose and direction from a business and technological standpoint. At the same time, the publishing of all agency business plans and IRM plans should be made available for informational purposes.

All agency plans should complement overall business objectives identified by the Office of Strategic Planning and Budgeting. It appears that regardless of the technological advances and/or improvements, IRM can never accomplish enough or solve problems with the right solutions. Business objectives and IRM technologies in some cases are incompatible.

Marketing IRM accomplishments is a matter of perspective, from differing organizations. Accomplishments may be considered a success by some and mediocre and/or a failure by others. Regardless of these perspectives, all projects should be measured through cost benefits identifying total investment, total net savings during the life of the project, economic investment, total net savings during the life of the product, economic project life, annual net savings, break-even payback period, rate of return on investment and intangible benefit rating. These measurable items will quantify all benefits to specific business needs and determine the value of success.

Marketing the benefits of accomplishments on a statewide basis is a new endeavor for the state and can be very rewarding for all agencies as well as the public and private sectors. A good marketing report should identify the following seven tasks: 1) fiscal year objectives; 2) governmental accomplishments; 3) intergovernmental analysis, i.e., AEITC (Arizona Educational and Informational Telecommunications Cooperative), DOA (Department of Administration), DOR (Department of Revenue), etc.; 4) situation analysis, including a) where are we?, b) where are we going?, c) how are we going to get there?, d) establish a project calendar; 5) media plan, including a) objectives, b) strategies, c) budget; 6) budgeting the plan; and 7) census information.

Involvement from public and private sectors is key to the direction and success of our statewide strategies and goals. Their creativity and the variety of their products will enable the state to arrive at solutions that best fit our needs. Public and private partnerships are recommended to develop and to implement cost effective, technically sound, far reaching information technology solutions that are necessary to meet tomorrow's information needs. One of the supporting mechanisms for successful partnership building in Arizona is the involvement of the Governor's office and the Arizona Legislature.

In order to arrive at these solutions information must be provided in a timely fashion through a central organization and/or committee that has the stature and clout to enforce strategic and tactical directions. State agencies and third party

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vendors need a central focus for cohesiveness and support.

Perception of government on the most part is one of reliability but slow to change and unclear in direction and goals. There are many individuals who are skilled and knowledgeable on subject matters but fall short on the execution side. This is attributed to poor or numerous plans, misunderstanding business needs or applications and difficult procurement rules and guidelines.

The concept of cooperative efforts should be a never ending process of sharing leadership among all decision-makers in state government. Because of the variety of technologies throughout the state, downsizing efforts, eliminating redundancy and costs reductions could be severely hampered if cooperative efforts are not developed and supported. The strand believes there is a need to establish a responsible, full-time person, agency or organization with a specific responsibility to create an office that will oversee all of the work that groups like AEITC are doing. An important interim next step to take in this area of cooperation is to have this committee (the government and military strand) continue to work together.

On a statewide basis, the "AS IS" environment should be addressed with all agencies to better understand our inventory of technologies. The central organization and/or committee mentioned in this strand perspective should have the responsibility and authority of analyzing all technologies. The end result is to determine the "domain of change" and develop the "TO BE" environment which includes proposed solutions and funding recommendations. This process at best, is a three year planning effort producing a ten year deliverable plan of accomplishments. This would be a Statewide Cooperative Technological Plan.

The whole process of funding is a concern for most agencies. The ability to forecast needs periodically is lacking, and if changes are imposed by a central organization and/or committee, who assumes funding responsibility to meet our statewide goals? To secure adequate funding from federal, state, local and private sources, an overall Statewide Cooperative Technological Plan must be in place. Top-down disciplines with bottom-up participation is necessary in arriving at timely and justified funding for automation technologies. Federal, state, local, and private sources must be identified to provide sufficient resources to support public access to governmental and educational systems through the best available technologies.

Consensus among the government and military strand participants is that all too often agencies use hardware and software solutions to solve business needs without determining needs assessments and benefits. As a result, the state may end up with incompatible technologies, redundant technologies and exorbitant costs. The ability to forecast business and technological needs should be supported by cost benefits in accomplishing meaningful results.

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VII. Government and Military Directives

These directives were developed during two days of deliberations by the Government and Military Strand of the Telecom*100. The names of those involved in developing these directives may be found in Appendix B. The content has been reformatted for readability, but otherwise is unedited.

A. Funding

1. Recommended Implementation Organizations:
   a. AEITC carry the recommendations forward to state, local, and county agencies; [provide] coordination

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b. Providers of services - put together proposals for "action" (i.e., funding grants)
c. Legislative and legislative staff bodies
d. State agencies/entities - statewide emphasis
   1. State Automation Comm.
   2. Governor's Office of Excellence
   3. Arizona Department of Administration
e. Budget offices

2. Supporting Mechanism:
   a. Statewide, orchestrated plan that everyone will agree to
   b. Figure out how to eliminate competing/conflicting activities
   c. Develop "one voice" (AEITC, AZTEL 2000, CIO Council, etc.)
   d. Coordinate activities with marketing efforts
   e. Statute changes - new legislation (all levels)
   f. Developing mechanisms/ways to use the money we currently have more wisely - more flexibility in policies/procedures
3. Evaluation/Next Steps:
   a. Develop ways to demonstrate how IT (information technology) is delivering cost-efficient/ effective services
   b. Focus on outcomes-quantification
   c. Cross-functional interagency cooperation documented and shared
   d. Develop new lottery game that focuses on telecommunications
4. Timeline/Funding Sources:
   Dependent on:
   a. Development of consolidated plan
   b. Identifying/educating legislative "champions"
   c. Change of perceived need "create the dream"
   d. Must be "enunciated" vision to communicate to decision-makers about where we need to go

B. Marketing

1. Recommended Implementation Organizations:
   a. AEITC - Coordination of assessment of what we are doing and how
   b. AZTEL 2000 subgroup - doing survey to establish "as is"
   c. Every organization doing anything in use of IT to deliver service - "each one teach one"
   d. Organizational public information officers
2. Supporting Mechanism:
   a. Develop common marketing plan
   b. Create an orchestrated message delivery system using variety of media
   c. Audio/video media (professional) should be recruited to help develop the education/media campaign
   d. "Exploit" current successes while we wait for orchestrated plan
   e. Identify specific individuals who will be responsible for doing this
3. Evaluation/Next Steps:
   a. Evaluate players (internal & external)
   b. Publicize results of the symposium
   c. Hold additional forums for discussions between public and private organizations
   d. Evaluate: Funding identified and available champions identified & on board
   e. Understanding how various groups are working together - roles of groups-one voice
4. Timeline/Funding Sources:
   a. Dependent on orchestrated plan
   b. Dependent on involvement of private sector

C. Public/Private

1. Recommended Implementation Organizations:
   a. Interagency technology evaluation groups
   b. GSPED
   c. Procurement offices
   d. Legal offices

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e. Corporation Commission staff
f. Chambers of Commerce
g. TCA
h. Department of Education
i. Department of Library & Archives
j. Educational Institutions

2. Supporting Mechanism:
   a. Legislative changes to statutes that inhibit public/private corporations
   b. Changes in procurement policies and procedures
   c. Develop awareness of the issues
   d. Define "partnerships" document - how a good partnership can/should work
   e. Teach "agencies/orgs" how to identify and work with partners from private industry
3. Evaluation/Next Steps:
   a. Establish some inter-agency technical evaluation groups to talk with private industry
   b. Publicize current private/public partnerships to show how they can work
   c. Determine if there are ongoing planning activities that can be "piggy-backed" on
   d. Tie back to marketing plan issues
   e. Develop applications to drive partnerships
4. Timeline/Funding Sources:
   a. What is AZTEL 2000 timeline?
   b. Begin partnership discussions as applications are identified

D. Applications

1. Recommended Implementation Organizations:
   a. All government agencies, educational institutions, etc. - identifying goals, needs of customers
   b. Arizona Geographical Information council and other "standards" bodies
   c. Chambers of Commerce
   d. (All under public private category)
2. Supporting Mechanism:
   a. Develop way for organizational planning groups to share activities
   b. Develop way to share data which is currently being obtained by individual organizations
   c. Develop database of applications and what is happening in telecom
   d. Customer surveys - need and satisfaction
   e. Adopt technical standards for common ways to access information
   f. Customer focus groups
   g. "Town hall" discussions
   h. Use Internet tools (i.e., Gopher or WAIS) to share information and gather ideas
   i. Use technologies to collect "customer" input
3. Evaluation/Next Steps:
   a. Go to the New Times for help in identifying the "Top 25" applications
   b. Identify some immediate projects that can be done and publicized
4. Timeline/Funding Sources:
   Dependent on:
   a. Development of consolidated plan
   b. Identifying/educating legislative "champions"
   c. Change of perceived need "create the dream"
   d. Must be "enunciated" vision to communicate to decision-makers about where we need to go

E. Cooperation On What We Have

1. Recommended Implementation Organizations:
   a. All agencies with existing networks
   b. AEITC and its member institutions
   c. Existing private network owners
   d. Governor's Office
   e. AZTEL 2000
   f. CIO Council
2. Supporting Mechanism:
   a. Standards bodies that develop ways for us to cooperative effectively
   b. Establish a "responsible, full-time" person/agency/organization with specific responsibility to create an "Office of _____"

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c. Staffing for effort must be established to coordinate "tomorrow's network"
d. Need to determine way to give "clout" to the "coordinating body" or "office"

3. Evaluation/Next Steps:
   a. Collect information on what is happening
   b. Establish "Office of _____" for planning operation, implementation - clearinghouse/ brokering
   c. Hold additional, ongoing meetings like this one
   d. "Government" needs to figure out how to work better with "government"
   e. Publicize what is happening in broad-based way
   f. Establish service level standards and policies
   g. Identify what current networks are compatible today and how to create more compatibility
   h. Use Internet tools to share information-WAIS/Gopher - listserves
   i. Get all groups doing this together- "coordinating committee" to coordinate and stop duplicating efforts
   j. AEITC to share ALL results of the symposium with participant information (names, phone numbers, etc.) for ongoing networking
4. Timeline/Funding Sources:
   a. Coordinate with current activities of AZTEL 2000, GSPED, etc.

VIII. Community Organizations Strand Perspective

The community organizations strand brought together educators, librarians, telecom representatives, community service leaders, and health administrators. The group defined themselves as those in the community who are providing a service, whether it be schools providing education and utilizing services, or each as part of the general public wanting more access to technology and available information.

Eighteen different areas were discussed. The three which were selected to emphasize were addressed from the perspective of the general public or the lay person.

Equitable access was a focal point. The critical issues were: Who needs access? Who has the right to this access? Are there any barriers with this access?

Minimum universal service standards must be defined. Given Arizona's legal and regulatory parameters, a survey and analysis of other states' standards should be conducted which will enable Arizona to create standards that will meet its citizens' needs.

It was recommended AEITC conduct a workshop to educate and inform the Corporation Commission about issues related to minimum universal service and legal issues and regulations. Decisions made by the Corporation Commission, with respect to regulations, impact current and future telecommunications networks and plans. It is the strand's contention that the Corporation Commission wants to hear from service providers and consumers in order to regulate telecommunications activities.

It was recommended AEITC conduct telecommunications workshops, seminars, and conferences to further the ideas raised at the symposium. In addition, this symposium should be repeated in 1994. These are excellent ways to share information, strengthen relationships, and build potential partnerships.

AEITC should establish strong relationships with other important groups in business and government, such as AZTEL 2000 and GSPED. All of these need to partner together and address public policy and access issues. Other critical issues which were discussed at length were

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standards information, connectivity, and information overload.

The most important objective is to promote lifelong learning in and with information technology. In addition to that, user self knowledge and confidence through currently available technology should be emphasized.

The participants of this strand agreed Arizona should have a comprehensive telecommunications curriculum in secondary to post-doctorate education and vocational training settings. This will assist Arizona businesses and government by providing a well educated, well trained employment base.

Finally and most importantly, one statewide organization which provides the vision for and coordination of telecommunications activities in Arizona must be supported. Among its many responsibilities, it must be a leader in the development and implementation of a statewide technology plan to achieve minimum universal standards.

Timelines were not specifically defined because the timeline is now and forever. This becomes an infinite process and infinite responsibility to and for all of us.

IX. Community Organizations Directives

These directives were developed during two days of deliberations by the Community Organizations Strand of the Telecom*100. The names of those involved in developing these directives may be found in Appendix B. The content has been reformatted for readability, but otherwise is unedited.

A. Technology Induced Issues - Objective: Define minimum universal service standard.

1. Recommended Implementation Organizations:
   a. AEITC should conduct a workshop for the Corporation Commission to provide issues of access and availability and the perspective of community, educational, and business groups.
   b. AEITC, in partnership with other appropriate groups, should conduct public policy forums on public access issues.

B. Education of Public - Objective: Promote life long learning in and with information technology.

1. Recommendations:
   a. Set up timely teleconferencing events (i.e., meetings, workshops, etc.) to continually inform ourselves, users, local government officials, decision makers and partnering leaders to the access needs of the public.
   b. Repeat this type of symposium next year.

C. Coordination - Objective: Provide one statewide organization which will develop a technology plan which clearly defines the areas of responsibility from whom and how we can get access to minimum universal service standards.

1. Recommendations:
   a. AEITC call a meeting with AZTEL 2000 and GSPED to coordinate roles for the development of a state wide technology plan.

X. Critical Issues

Eight critical issues were raised repeatedly by the Telecom*100. These critical issues must be addressed independently and collectively by education, business and industry, government and military, libraries, civic organizations, and individuals in the State of Arizona.

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The order in which the eight critical issues appear is reflective of editorial organization. Therefore, it is recommended that each issue be seen as vital to the success of the State of Arizona and its endeavor to lead the nation in telecommunications efforts in the Twenty-First Century.

A. Cooperation

Support a statewide organization which encourages and advances cooperative planning and development of telecommunications among education, business, industry, government, military, libraries, civic organizations and individuals in the State of Arizona.

Arizona citizens, organizations, and communities have a common interest in exploring ways in which they can work together to develop systems and services that will meet telecommunications needs throughout the State of Arizona. A social and organizational transformation needs to occur, putting turf issues to rest and developing powerful partnerships; assisting the transformation of Arizona from an industrial to an informational society; and supporting an open, not closed/controlled architecture and organization.

The statewide organization which is envisioned should foster cooperation among organizations and act as advocate for the unserved and underserved. Among the issues which the organization would address are equitable access to information without regard to geography, age, culture, economics and disability.

The statewide organization should encourage cooperation of education, business and industry, government, the military and individuals in utilizing telecommunications to the betterment of each entity and the State of Arizona. It would represent statewide telecommunications issues to the Arizona Governor's Office, the Arizona Legislature, federal, state and local governments.

The statewide organization should encourage the formulation of coordinated policies and procedures to guide the use of telecommunications for educational and informational purposes, deal with governance issues, public policies and regulations related to telecommunications.

The statewide organization should assist in the development of a technology plan which clearly defines the areas of responsibility from whom and how citizens and organizations can have access to minimum universal telecommunication service standards. It should eliminate unnecessary redundancy of systems and groups.

Among the current organizations which should be integrally involved in the support of such a statewide telecommunication organization are all agencies with existing networks, AEITC and its member institutions, existing private network owners, the Arizona Governor's Office, AZTEL 2000, and the CIO Council.

The mechanisms which are recognized as important to support a statewide telecommunication organization are the creation of telecommunication standards bodies that develop ways for organizations to cooperate effectively.

This statewide telecommunication organization must be empowered to give "clout" to its undertakings. In an effort to continue the momentum achieved at The Arizona Telecommunications Issues and Policy Symposium, the Telecom*100 call for additional meetings like the symposium. It is noted that another effective and efficient means of collaboration is via telecommunications, specifically Internet tools to share information via the Internet WAIS, Gopher, and listserves.

Arizona can little afford more duplication and independent efforts. A statewide organization must be supported whole-

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heartedly by education, business and industry, government and military, libraries and civic organizations, as well as individuals.

B. Public/Private Partnerships

Plan and support public/private partnerships to develop and implement the cost-effective, technically-sound, far-reaching information technology solutions necessary to meet tomorrow's applications and information needs.

Directly related to the key policy issue of cooperation is the establishment of public/private partnerships in Arizona. Every sector of society should be involved in a statewide telecommunications partnership program. All sectors have much to contribute; all can benefit. The synergy created will enable the state of Arizona to take full advantage of present opportunities in the information age and prepare for the virtual age of the Twenty-First Century.

A productive first-step in this endeavor would be for private companies to make available their technology plans to help public organizations learn from successful models. Interagency technology evaluating groups and focal point industry contacts should be united in a productive public/private partnership effort.

A "partnership" document outlining how good partnerships can and should work would be invaluable to this effort. Further, an effort should be made to teach agencies how to identify and work with partners from private industry.

Meeting the needs, requirements, and interests of the public by cooperatively developing products and programs which are delivered via telecommunications is strongly endorsed. Such application-driven technology solutions will ensure Arizona makes the correct short and long-term choices as it links its present telecommunications networks and connects to and builds an information highway.

Changes will need to be made in current statutes that inhibit public/private cooperation. Restrictive regulations that prohibit public/private partnerships should be removed in order to develop a cost sharing process between government, education and business.

Additionally, the state of Arizona would benefit greatly from changes in procurement policies and procedures in both the public and private sectors to create economies of scale currently unavailable in telecommunications planning and procurement.

C. Marketing

Develop and implement a marketing and education program to increase awareness and acceptance of telecommunications applications and technologies in order to provide minimum universal access, without regard to geography, culture, economics, or disability; to inform all sectors of society of the benefits of common accessible networks; to promote lifelong learning through the use of technology; to promote the use of currently available telecommunications systems; and to adopt telecommunications as a vital and indispensable resource for the citizens of Arizona.

The initial marketing requirement noted by the Telecom*100 was to assess the current telecommunications environment and emerging needs in the state with regard to resources, expenditures, applications, benefits and shortcomings, accountability, procurement policies and statutes.

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In developing a formal marketing plan, key audiences must be identified, targeted, and where applicable, lobbied. Specifically, those are the Arizona Governor's Office, the Arizona Legislature, media, the private sector, state agencies, public information officers and employees, and special interest groups. "Champions" must be identified and secured to act on telecommunications issues, policy statements, and directives articulated by the Telecom*100.

The development of a common marketing plan also was chief among the supporting mechanisms recommended by the Telecom*100. Research should be conducted to identify other successful state programs.

An orchestrated message delivery system using a variety of media should be created., Audio/video media professionals should be recruited to help develop the education/ media campaign. Additionally, an inclusive state telecommunications directory should be produced which will act as a "yellow pages" for those who are interested in telecommunications.

In the interim it is necessary to "exploit" current successes while an orchestrated plan is being developed. Specific individuals and/or groups who will be responsible for doing this should be identified. Among those may be AEITC, AZTEL 2000, state public information officers, small business associations, chambers of commerce, and the Economic Development Council.

The recommended next steps are to publicize the results of The Arizona Telecommunications Issues and Policy Symposium and to hold additional forums for discussions between public and private organizations.

The timeline is dependent on the development and implementation of an orchestrated plan as well as the involvement and support of the private sector.

D. Applications

Meet the current and future needs of the citizens of Arizona with high quality, reasonably priced programs, products, and services which are produced or acquired for delivery via telecommunications.

The information superhighway will enable Arizona citizens to shop in the global information supermarket. It isn't how we get there that is important; it is making sure we get there and what we have access to that are important!

One current critical need in Arizona is a telecommunications information and education clearinghouse. All available applications and timely information about the state of telecommunications in Arizona, across the country, and around the world should be held in this repository. The statewide telecommunications organization would be the best institution to host such a repository.

A telecommunication application needs assessment must be performed in Arizona to determine all of the types of applications which are available currently. After such an assessment, organizations whose mission it is to provide those applications must be made aware of unmet needs. Application-driven partnerships will encourage "organizational "planning groups to gather and share data, to share activities, and to meet the needs of the citizens of Arizona.

Further, collaborative research should be conducted to determine the future applications needs and requirements in the Twenty-First Century. Today, it is not abundantly clear what telecommunications products and services will be in demand or necessary to enable Arizonans to compete and prosper in the global village.

According to the Gartner Group, if all industries that are likely to be on the information superhighway were combined

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today, their 1992 revenues would be $394 billion or 7% of total U.S. gross nation product. Among the industries included in the estimate are: IXC, cable television, video rentals, movie box office, LEC, video games, broadcast television, recorded music, broadcast radio, catalogue sales, publishing, and information services, according to the Gartner Group.

Educational, medical, and social services are important applications. Tele-learning, tele-medicine and tele-services need not be constrained by distance, time and access. Many Arizona educational, medical and social service organizations are pioneering the use of telecommunications as a delivery mechanism for their information and services.

With the advent of a more robust and pervasive information superhighway, which is responsive to the applications needs and requirements of citizens, Arizona and its citizens will undoubtedly benefit.

E. Education, Training and Retraining

Develop and implement a statewide education, training, and retraining program which will promote lifelong learning through the use of technology; establish a training and education curriculum from secondary to post-doctoral levels for telecommunications/ information management; inform and educate public and private sectors of the benefits of common accessible networks; and develop a telecommunications methodology to eradicate illiteracy.

The Telecom*100 believe education, training and retraining utilizing telecommunications will equitably provide the highest quality education and training to Arizonans in the most cost-effective manner possible. We can no longer teach our people with a piece of chalk and expect them to compete effectively in the global village of the Twenty-First Century.

All sectors of Arizona will benefit from an integrated education, training, and retraining program. Public and private elementary, secondary, associate, baccalaureate, graduate, post-graduate, continuing and technical learning institutions and libraries will benefit from such an integrated program on the information highway. Not only will children be able to receive quality education and information, teachers, administrators, and librarians will be able to communicate, access information, receive further training, expand their curricula, enrich their learning environments and be part of the information age solutions to the industrial age problems.

Business and industry have a tremendous need for remedial, literacy, internal and external training, retraining, and technical information. The most cost-effective method for delivery of the information is via telecommunications.

Federal, state, and local governments mirror the needs of business and industry, but must also be part of the solution. Each is making significant contribution to the education, training and retraining effort. Linking the efforts will allow governments to better serve their citizens and be better served via telecommunications.

Individual citizens, particularly those who are disenfranchised, will benefit most from a telecommunications education, training and retraining program. Those who are unemployed and unemployable should be able to receive remedial, literacy, training, retraining, and technical information in their homes, or at least in a convenient community location.

Senior citizens will find personal enrichment programming opportunities, as well as the other types of education and training described above, stimulating and accessible from the comfort of their homes and communities.

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A clearinghouse of education, training and retraining programs should be established for one-stop shopping of the resources and information currently available in the state of Arizona. The information highway which Arizona needs will link its citizens to a plethora of information from around the world.

A special emphasis must be made regarding the need for all citizens to be literate. The Committee for Economic Development found that every dollar spent on early prevention and intervention can save $4.74 in costs of remedial education, welfare, and crime in the future. Telecommunicated literacy education avoids the stigma attached with illiteracy. A citizen would be able to learn to read and expand his/her knowledge without leaving the privacy of the home or community.

To paraphrase a statement from Technology Integrated Educational Delivery System:

> ***To deny Arizona's citizens access to information is to deny them their futures. Information is, indeed, power. It is the wealth of society and of its people. Failure to provide all Arizonans access to all sources of information is to confine them to a future without prospect.***

Editor's Note: Arizona's seminal document about technology in relation to education and training is the Technology Integrated Educational Delivery System (TIEDS), a master plan which calls for the infusion of technology in elementary and secondary education. Please refer to Appendix E.

F. Regulatory, Legal and Legislative Issues

Establish and protect a regulatory and legal environment which progressively situates the State of Arizona to balance public and private needs, open competition, public/ private roles, service equality, and accessibility to a statewide "commercial strength" information infrastructure.

At present there are many organizations, industries and governmental agencies involved in a wide variety of activities in the fields of information and education technology. Those with regulatory authority are attempting to make public policy decisions without benefit of a complete assessment of current activities (and the entities responsible for that activity), let alone what might stand off just beyond the horizon. Furthermore, there exists a fundamental question as to the role of (and relationship between) private and public providers and consumers of these information and education technologies. An additional complication to this fundamental challenge is to be found in the area of financial resources or support for access to these technologies: Should there be a level of publicly supported access to ensure that an "information elite" doesn't dominate those who are economically disadvantaged?

Some of the tangentially aligned issues involve: equalization of school district funding in Arizona; private sector (for-profit) use of publicly supported (or generated) databases; the public's right to know and how that access is to be paid for and maintained; a resolution of the tension between a citizen's right to know about his/her government and the need for protection of the privacy of the individual; the imposition of fees for the right to access public databases; appropriate protocols for the sharing of finite resources (human, technologies, funding, etc.). There was a considerable amount of discussion on the topic of access to information---regardless of its content. It was generally agreed that the technology part of the equation (the hardware) was far less important than the ultimate application and the ability of the consumer to have access to the information pathway.

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Consensus must be built within the information community in an effort to avoid duplication, minimize unnecessary competition, and maximize the potential for the possibilities inherent in these emerging technologies and their applications. A strategic partnership must be formed with the Arizona Corporation Commission in order to provide them with issues of access to, availability of educational and informational technologies, and the perspective of community, education and business groups.

Further, AEITC, in partnership with other appropriate groups, should conduct public policy forums--and engage in other public education processes and forums--on public access issues.

The parameters and implications of universal information technology access with regard to security, privacy, standards, liabilities, and accessibility must be identified. Legislative measures should then be drafted and submitted in order to resolve the challenges identified in the above processes.

Revisions in various regulatory systems are needed in order to address the issues of open competition, public/private roles, and service equality. Legislative initiatives or lobbying efforts may need to be put in place to assist in implementing these changes.

A substantial amount of linkage with the balance of the information community should be in place, along with a commensurate amount of consensus on roles, relationships and overall direction. Public policy forums and workshops that involve not only other information communications organizations but a broad spectrum, of public input should be held.

Understanding the parameters and implications of universal information technology access in a format that will facilitate the drafting of legislation for Arizona will be most useful. The culmination regulatory, legislative and legal information gathering, dissemination, and revision will enable Arizona to capitalize on the national information infrastructure window of opportunity.

Contributing Author: David Snider, Director of Library Services, Casa Grande Public Library

G. Technology

> *Embrace, develop, use, link and evolve all advanced telecommunications technology in order to provide a ubiquitous information infrastructure with universal access to education and information by the citizens of Arizona, without regard to geography, culture, economics, or disability.*

Technology must be transparent to the end-user like flipping on a light switch as one enters a dark room. The user should not be concerned about how the electricity was created, harnessed, housed for on-demand request, or transported. The state of Arizona has the responsibility to provide, and all citizens of Arizona should have the opportunity to afford, minimum universal information access.

When railroad companies in this country began to build the continental railroad, the companies believed they were in the "railroad" business, not the "transportation" business. Therefore, rails were laid, bridges erected and depots built without regard to the evolving needs and requirements of those communities geographically distant from railroads. Ubiquitous transportation was not a strategic goal.

Today interstate transportation occurs by rail, highway, air, water, and telecommunications. Railroads have declined and may never recover in the United States because the transportation needs and requirements of the end-user were unmet.

Arizona has an unmatched opportunity to meet the current and future, known and

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imagined information access, applications, needs and requirements of its citizens, as well as citizens of the United States and the world, by planning and establishing a ubiquitous, interoperable information infrastructure for the Twenty-First Century.

As telecommunications technologies have advanced and applications have broadened, the use of electronic tools--video, audio, and data--has grown considerably in Arizona. Consequently, distance from vital resources no longer need be a real obstacle to making use of those resources. Further, video, voice and computer technologies will meld into one "virtual" media in the Twenty-First Century.

The needs and requirements of the citizens must be assessed and a technology plan developed and implemented to ensure Arizona is an equal partner in the information age of today and the virtual age of tomorrow. The first interim step is to link and coordinate current voice, video, and data infrastructures in Arizona. These independent infrastructures have developed to address independent applications, and any future proliferation of such isolated networks must be avoided.

As a whole, the independent networks which are in place currently in Arizona lack statewide equity, accessibility, accountability, and sufficiency due to the absence of coordination and cooperation. In Phoenix a consumer can get on a state-of-the-art, easy-to-access highway to satisfy a need. That need might be getting a first-rate education, attending a one-of-a-kind program, purchasing goods or services, or just getting to work. Today the same Phoenix citizen can satisfy those same needs via telecommunications. The citizens of Charco and Blue Gap have the same needs, but, for the most part, are unable to satisfy those needs via telecommunications.

Telecommunication services have been more available in metropolitan areas than in rural Arizona, more typically used in business than by the general public, and more responsive to market trends and isolated decisions than to the rigorous demands of a long-term statewide telecommunications plan. This need not be.

The Arizona Corporation Communication must be a partner in this process. Re-regulation, not deregulation or more regulation, should address open competition and the need for commercial networks. By encouraging and providing incentives for open competition, the superhighway will become a reality. Telecommunication costs to remote areas must be minimal. In addition, "green space" could be provided by private industry to education. Delivery system and technological services set-asides of private industry could be a windfall to the public sector, particularly education.

Finally, there exists a need for telecommunications curricula and training programs, from secondary to post-doctoral levels, to prepare telecommunications specialists, technicians, educators, and managers to assist Arizona public and private entities in the information age of the Twenty-First Century. As Arizona builds its infrastructure, it must educate and train those who will operate, utilize and manage it.

H. Funding

Secure immediate and perpetual funding from federal, state, local, and private sources sufficient to establish an Arizona information infrastructure and to support minimum universal access to education and information via that information infrastructure by every citizen of the State of Arizona.

Underlying Issues

1. Government has responsibility to educate citizens (students of all ages) to acceptable standards.

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2. Government must ensure its citizens are sufficiently literate to benefit from and contribute to society.
3. Government must maintain funding for education sufficient to meet the changing needs of contemporary education.
4. People have a fundamental right to access information from their government(s) using the best available technologies.
5. Public entities must be compensated by private, for-profit enterprises which benefit from the use of public databases.
6. Individual privacy must be safeguarded at all costs.
7. An environment must be exist to ensure private sector participation as a stakeholder of the statewide information infrastructure.

Waiting to invest in a statewide information infrastructure will not lessen its cost. The educational, social, commercial and international opportunity costs of such a delay will far outweigh any imagined savings.

In 1990 AEITC received an appropriation (Senate Bill 1024) to conduct a telecommunications feasibility study in Arizona. The study resulted in a Report for a Statewide Network, which recommended a statewide network using satellite and land-based delivery systems for an estimated cost of $12,750,000. Given that such a study was conducted in 1990, the State of Arizona must not hesitate further to support the implementation of the recommendations contained in this document. A statewide, comprehensive telecommunications funding plan must be developed and implemented.

Among the funding sources which must be secured are: the Arizona Legislature, Arizona-based and other foundations, private telecommunications corporations, and the federal government.

First, the people of Arizona look to their governor and legislators as strategic partners in this endeavor for leadership and fiscal support for telecommunications. For example, not only must no new legislation be passed without supportive funding, policies and procedures must be established to more wisely, equitably and flexibly distribute funding for telecommunications. The need for immediate and perpetual funding from the state of Arizona to guarantee access to education and information via telecommunications is incontrovertible.

Second, working with the Governor's Office of Excellence, the Arizona Legislature and legislative staff, the State Automation Committee, the Arizona Department of Administration, budget offices and all telecommunications network and service providers, as well as the private sector, collaborative and mutually supportive grant proposals must be submitted to funding sources as part of a statewide, comprehensive telecommunications funding plan.

The private sector must be a strategic partner with the state of Arizona, the federal government, and others to construct the information superhighway which will ensure a minimum standard of universal access to information by all citizens of Arizona.

Finally, the vision of President Clinton and Vice President Gore encourages the federal government to be a strategic partner with the State of Arizona and its citizens. Arizona's congressional delegation will be key to Arizona's success in attracting substantial immediate and perpetual federal funds to the state.

XI. CONCLUSIONS

The Telecom*100 recommended AEITC carry these recommendations forward to federal, state, county, and local agencies and provide coordination among them. No one piece of this telecommunications mosaic gives a clear picture of what is in-store for Arizona and its citizens in the Twenty-First Century. And no piece can be left out without distorting the outcome.

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By implementing the recommendations of the Telecom*100, the State of Arizona will support President Clinton's Vision Statement for the national information infrastructure to "be used by all Americans, not just by scientists and engineers. As entrepreneurs, factory workers, doctors, teachers, federal employees, and citizens, Americans can harness this technology to:

- Create jobs, spur growth, and foster U.S. technological leadership;
- Reduce health care costs while increasing the quality of service in underserved areas;
- Deliver higher-quality, lower-cost government services;
- Prepare our children for the fast-paced workplace of the 21st century; and
- Build a more open and participatory democracy at all levels of government."

The details provided in this document constitute the Arizona telecommunications roadmap for taking the next progressive steps...into the Twenty-First Century!

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APPENDIX A

*THE 16 DIRECTIVES OF THE TELECOM*100*

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Education Directives

A. Design Standards
   1. Concerned with Open International Standards
   2. Definition of Interfaces
   3. Support for Legacy Systems (those systems currently in place)
   4. Interface for Private Entry Exit Forces
   5. Scalable Architecture
   6. State Contract out (AEITC) with Authority & Responsibility

B. Identify, Recommend, and provide training for applications that benefit education.

   1. Recommended Solution(s):
      a. Research successful programs
      b. Evaluate hardware and software
      c. Field trials
      d. Disseminate information
      e. Sponsor training

   2. Recommended Implementation Organizations:
      AEA - AEITC - AEMA - ASLA
      AASA - MORRISON INSTITUTE (ASU)
      State Department of Education - Universities and others

   3. Timeline:
      On going, ASAP

   4. Evaluation:
      Continuous

C. Parity: Comparable opportunity as comparability relates to geography, culture, economics, disability

   1. Recommended Solution(s):
      a. Establish needs analysis as defined by users
      b. Identify basic package of information services available to all Arizona residence

   2. Recommended Implementation Organizations:
      AEITC in conjunction with constitution information service

   3. Supporting Mechanism:
      a. Standards as established in A.
      b. Other organizations that will provide input and implementation.

   4. Timeline:
      Need as soon as possible, as much as possible, because every day kids are losing out

   5. Evaluation:
      a. Identify immediate funding sources for AEITC
      b. Follow-up on survey with all kids that were involved in the process

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Education Directives
(Continued)

D. Cost/Funding

1. Need to develop a Strategic Plan
2. Within AEITC setup 501C3 to select dollars from both foundations, etc. and promote "the plan"
3. Not to rely on State for monies
4. Recommended Implementation Organizations:
   a. AEITC and subsets
   b. AEMA
5. Timeline:
   Plan for Strategic Plan in 94 AEITC meeting

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Business and Industry Directives

A. Regulatory System needs revision to address open competition, public private roles, service equality

1. Recommended Solution(s):
   a. Analysis of requirements
   b. Collective needs (Telecom organizations, TCA, AEITC, and vendors)
   c. Modernize Regulatory System to address current and future needs for telecom within the state of Arizona.
   d. Encourage and incentivize open competition to invest in baseline technology.

B. Requirement for Statewide Commercial Strength networks services, avoid proliferation of isolated networks

1. Recommended Solution(s):
   a. Form a formal policy group, to consist of all stakeholders, to provide a single point of focus and linkage to other telecommunications organizations to perform following:
      1. Define reporting authority of the policy group
      2. Inventory collective requirements
      3. Standards setting
      4. Develop strategic alliances
      5. Define benefits
   b. Leverage vendors to develop communications solutions
   c. Create environment for a statewide commercial multimedia telecom network

C. Legal and Security Issues to address: Security/Privacy/ Standards/ Liability/Accessibility

1. Recommended Solution(s):
   a. Identify the issues, i.e.
      - electronic signatures
      - data integrity
      - data originality

D. Need to inform and educate public and private sectors of the benefits of common accessible networks

1. Recommended Solution(s):
   a. Publicize the communications issues:
      1. Marketing strategy
      2. Public forums
      3. Lobbying
      4. Directories
      5. Other forums for discussion, i.e. Arizona Town Hall, Economic Development Councils
   b. Involve small business associations and Chambers of Commerce in Policy Group.
   c. Publicize the benefits, i.e. information dissemination.

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Government and Military Directives

A. Funding

1. Recommended Implementation Organizations:

   a. AEITC carry the recommendations forward to state, local, and county agencies; coordination
   b. Providers of services - put together proposals for "action" (i.e., funding grants)
   c. Legislative and legislative staff bodies
   d. State agencies/entities-statewide emphasis
      1. State Automation Comm.
      2. Governor's Office of Excellence
      3. Arizona Department of Administration
   e. Budget offices

2. Supporting Mechanism:

   a. Statewide, orchestrated plan that everyone will agree to
   b. Figure out how to eliminate competing/conflicting activities
   c. Develop "one voice" (AEITC, AZTEL 2000, CIO Council, etc.)
   d. Coordinate activities with marketing efforts
   e. Statute changes - new legislation (all levels)
   f. Developing mechanisms/ways to use the money we currently have more wisely - more flexibility in policies/procedures

3. Evaluation/Next Steps:

   a. Develop ways to demonstrate how IT is delivering cost-efficient/effective services
   b. Focus on outcomes-quantification
   c. Cross-functional interagency cooperation documented and shared
   d. Develop new lottery game that focuses on telecommunications

4. Timeline/Funding Sources:

   Dependent on:
   a. Development of consolidated plan
   b. Identifying/educating legislative "champions"
   c. Change of perceived need "create the dream"
   d. Must be "enunciated" vision to communicate to decision-makers about where we need to go

B. Marketing

1. Recommended Implementation Organizations:

   a. AEITC - Coordination of assessment of what we are doing and how
   b. AZTEL 2000 subgroup - doing survey to establish "as is"
   c. Every organization doing anything in use of IT to deliver service - "each one teach one"
   d. Organizational public information officers

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2. Supporting Mechanism:

   a. Develop common marketing plan
   b. Create an orchestrated message delivery system using variety of media
   c. Audio/video media (professional) should be recruited to help develop the education/media campaign
   d. "Exploit" current successes while we wait for orchestrated plan
   e. Identify specific individuals who will be responsible for doing this

3. Evaluation/Next Steps:

   a. Evaluate players (internal & external)
   b. Publicize results of the symposium
   c. Hold additional forums for discussions between public and private organizations
   d. Evaluate: Funding identified and available champions identified & on board
   e. Understanding how various groups are working together - roles of groups-one voice

4. Timeline/Funding Sources:

   a. Dependent on orchestrated plan
   b. Dependent on involvement of private sector

C. Public/Private

1. Recommended Implementation Organizations:

   a. Interagency technology evaluation groups
   b. GSPED
   c. Procurement offices
   d. Legal offices
   e. Corporation Commission staff
   f. Chambers of Commerce
   g. TCA
   h. Department of Education
   i. Department of Library & Archives
   j. Educational Institutions

2. Supporting Mechanism:

   a. Legislative changes to statutes that inhibit public/private corporations
   b. Changes in procurement policies and procedures
   c. Develop awareness of the issues
   d. Define "partnerships" document - how a good partnership can/should work
   e. Teach "agencies/orgs" how to identify and work with partners from private industry

3. Evaluation/Next Steps:

   a. Establish some inter-agency technical evaluation groups to talk with private industry
   b. Publicize current private/public partnerships to show how they can work

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c. Determine if there are ongoing planning activities that can be "piggy-backed" on
d. Tie back to marketing plan issues
e. Develop applications to drive partnerships

4. Timeline/Funding Sources:

a. What is AZTEL 2000 timeline?
b. Begin partnership discussions as applications are identified

D. Applications

1. Recommended Implementation Organizations:

a. All government agencies, educational institutions, etc. - identifying goals, needs of customers
b. Arizona Geographical Information council and other "standards" bodies
c. Chambers of Commerce
d. All under public private category (Item C)

2. Supporting Mechanism:

a. Develop way for "organizational "planning groups to share activities
b. Develop way to share data which is currently being obtained by individual organizations
c. Develop database of applications and what is happening in telecom
d. Customer surveys - need and satisfaction
e. Adopt technical standards for common ways to access information
f. Customer focus groups
g. "Town hall" discussions
h. Use Internet tools (i.e., Gopher or WAIS) to share information and gather ideas
i. Use technologies to collect "customer" input

3. Evaluation/Next Steps:

a. Go to the New Times for help in identifying the "Top 25" applications
b. Identify some immediate projects that can be done and publicized

4. Timeline/Funding Sources:

Dependent on:
a. Development of consolidated plan
b. Identifying/educating legislative "champions"
c. Change of perceived need "create the dream"
d. Must be "enunciated" vision to communicate to decision-makers about where we need to go

E. Cooperation On What We Have

1. Recommended Implementation Organizations:

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Government and Military Directives
(Continued)

a. All agencies with existing networks
b. AEITC and its member institutions
c. Existing private network owners
d. Governor's Office
e. AZTEL 2000
f. CIO Council

2. Supporting Mechanism:

a. Standards bodies that develop ways for us to cooperative effectively
b. Establish a "responsible, full-time" person/agency/organization with specific responsibility to create an "Office of _____"
c. Staffing for effort must be established for full-time effort to coordinating "tomorrow's network"
d. Need to determine way to give "clout" to the "coordinating body" or "office"

3. Evaluation/Next Steps:

a. Collect information on what is happening
b. Establish "Office of _____" for planning operation/ implementation - clearinghouse/brokering
c. Hold additional /ongoing meetings like this one
d. "Government" needs to figure out how to work better with "government"
e. Publicize what is happening in broad-based way
f. Establish service level standards and policies
g. Identify what current networks are compatible today and how to create more compatibility
h. Use Internet tools to share information-WAIS/Gopher - listserves
i. Get all groups doing this together - "coordinating committee" to coordinate and stop duplicating efforts
j. AEITC to share ALL results of the symposium with participant information names, phone numbers, etc. for ongoing networking

4. Timeline/Funding Sources:

a. Coordinate with current activities of AZTEL 2000, GSPED, etc.

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Community Organizations Directives

A. Technology Induced Issues - Objective: Define minimum universal service standard.

1. Recommended Implementation Organizations:
   a. AEITC should conduct a workshop for the Corporation Commission to provide issues of access and availability and the perspective of community, educational, and business groups.
   b. AEITC, in partnership with other appropriate groups, should conduct public policy forums on public access issues.

B. Education of Public - Objective: Promote life long learning in and with information technology.

1. Recommendations:
   a. Set up timely teleconferencing events (i.e., meetings, workshops, etc.) to continually inform ourselves, users, local government officials, decision makers and partnering leaders to the access needs of the public.
   b. Repeat this type of symposium next year.

C. Coordination - Objective: Provide one statewide organization which will develop a technology plan which clearly defines the areas of responsibility from whom and how we can get access to minimum universal service standards.

1. Recommendations:
   a. AEITC calls a meeting with AZTEL 2000 and GSPED to coordinate roles for the development of a state wide technology plan.

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APPENDIX B

*THE TELECOM*100 DIRECTORY*

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Telecom*100

Business and Industry Strand

Richard Ashby, Administrative Office of the Courts - Arizona Supreme Court
John Badal, AT & T, Government Affairs
Arlene Bansal, State of Arizona Department of Library Archives and Public Records
Larry Beauchat, Information Services Division - Department of Administration
Duke Bonney, Phelps Dodge Corporation - C.I.S.
Terry Burns, Arizona Public Service Company, Telecommunications Network Engineering
Stacey Cochrane, Intel Corporation
Charlotte Frederick, Digital Equipment Corporation
Marsha Ham, University of Arizona Extended University
Al Hingle, Antenna Farms Inc.
Joan Hinson, John C. Lincoln Hospital, Telecommunications
Scott Hirsch, FHP Incorporated
Ron Kellogg, Citizens Utilities Company, Telephone Division
Paul Kessel, Mohave Community College
Ted Kraver, Governor's Strategic Partnership for Economic Development
John Lewis, Apollo Group, University of Phoenix
Todd Lutz, Mohave Community College
Brian Paige, Tucson Medical Center
Steve Peters, State Economic Development Library Committee
Gary Schmidt, St. Joseph's Hospital - Information Systems
Ronald F. Taylor, Motorola - Government and Systems Technology Group
Ron Trasente, Honeywell, Space & Aviation Control
Nancy Welch, Morrison Institute for Public Policy

Community Organizations Strand

Bob Baker, Pima Community College
Sam Behrend, Tucson Community Cable Corporation
Ann Bouwense, Arizona State University, Telephone Services
Debbie Burnham-Kidwell, Mohave County Library District
Betty Craft, Arizona State University, Distance Learning Technology
Nancy Cummings, Arizona State Library Association and Director
Mitchell Druckman, Cochise College, Information Systems
Jerry Freund, Tucson Medical Center
Gil Gonzales, Maricopa Community College District
Lorre Levy, Department of Library, Archives and Public Records
Joe Manning, KAET-TV, Engineering
Larry McAlister, Cochise College Libraries - Instructional Media Services
Tony Miele, Department of Library, Archives and Public Records
James Mossor, Cochise College, Information Systems
Lynne O'Donnell, Yavapai College, Community Programs & Telecommunications
Merrilyn S. Ridgeway, The University of Arizona
Sherrie Schmidt, Arizona State University, Dean of Libraries
Brian Siemens, Northland Pioneer College
Hank Stabler, Peoria Unified School District
Carla Stoffle, The University of Arizona Library
Barry Williams, Round Valley Unified Schools

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Community Organizations Strand (continued)

Ed Young, Coolidge High School
Millicent Valek, Arizona Western College

Education Strand

Art Ashton, Arizona Board of Regents
Joe Askins, Arizona State University, Telecommunications Services
Frank Besnette, Arizona Board of Regents
Oliver Barlow, Colorado City Unified School District #4
C. Diane Bishop, Superintendent of Public Instruction
Don Burgess, KUAT Communications Group, University of Arizona
Roberto Canchola, Santa Cruz County
Carl Chapman, Arizona State University West, Information Resources & Technology/Media Services
Carl Christensen, Antenna Farms Inc.
Darel Eschbach, Arizona State University, Telecommunications Services
Edward Groenhout, Northern Arizona University, Educational Systems Development
Gordon Hall, State Board of Directors for Community Colleges of Arizona
Clyde Holland, Arizona Board of Regents, Academic Programs
Dr. Mike Holmes, Arizona Western College, La Paz Center
Jeff Jessup, Colorado City Unified School District
Kathryn Kilroy, Arizona Department of Education
Addie Kinsinger, ASSET KAET, Arizona State University
William Lewis, Arizona State University
Linda Loomis, Amphitheater Public Schools
Bob Machinski, Department of Library, Archives and Public Records
Matt McGlamery, Northern Arizona University, Network & Telecommunications Services
Bob McKenzie, Round Valley School District
Susan Mitchell, University of Phoenix
William Noyes, University of Arizona
David Paldan, Motorola, Government & Systems Technology Group
Kathy Perko, Coconino County Schools
Don Puyear, Arizona Community College Board
Keith Seaman, Mohave County Schools
Tim Stephens, Alpha Communications
Dr. Michael Thomsen, Arizona State University, KAET Channel 8
Melanie Totcky, Apollo Group, University of Phoenix

Government and Industry Strand

Renee Adams, IBM Corporation
Jan Baltzer, Maricopa Community Colleges, Information Technologies Services
Max Brawley, City of Phoenix, Information Technology Management Department
Ann Bouwense, Arizona State University - Telephone Services
Richard Carlson, Arizona Department of Public Safety
Bill Cassels, Maricopa County, Telecommunications
Dana Femino, Arizona State Lottery, Data Processing
Ben Froehlich, Arizona Department of Administration, Information Services Department
Joan Houle, Arizona Game and Fish Department Data Branch

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Government and Industry Strand (continued)

Gloria Johnson, State of Arizona, Telecommunications
Jenny Kakol, Evergreen Communications
Dennis Kittrell, Arizona Department of Education, ISSU
Dawn Klitzke, Arizona Department of Transportation, Information Services Group
Curt Knight, Arizona Department of Public Safety
Rupert Loza, Arizona Lottery, Data Processing
Dave McCarroll, Arizona Department of Youth Treatment and Rehabilitation
Bill Meador, US West Communications Services, Business & Government Services
Brian Miller, US West Communication Services, Business & Government Services
Gary Mirich, IBM Corporation
Rob Olding, Arizona Department of Corrections, Management Information Services
Diana Sandy, Arizona Department of Administration
Jay J. Sferra, AT & T, Business Communications Services
Dave Snider, Casa Grande Public Library
Stephen Ventre, Maricopa County Superior Court
Bob Wetherell, Arizona Law Enforcement Officer Advisory Council

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APPENDIX C

THE ARIZONA TELECOMMUNICATIONS ISSUES AND POLICY SYMPOSIUM PROGRAM

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The Arizona Telecommunications Issues and Policy Symposium

Hosted by
Arizona Educational and Informational Telecommunications Cooperative

September 29, 30 and October 1, 1993

Sheraton San Marcos Resort
Chandler, Arizona

Symposium Director: Janelle E. O'Dell, Executive Director, AEITC

The Arizona Telecommunications Issues and Policy Symposium

Wednesday, September 29, 1993

5:00 - 7:00 PM **Registration** - San Marcos Ballroom Foyer

5:30 - 6:45 PM **No-Host Reception** - Fountain Pool

7:00 PM **Dinner** - San Marcos Ballroom

- **Welcome** - Dr. Don Puyear, Executive Director, Arizona Community College Board
- **Introductions** - Ms. Kathryn Kilroy, State Director for Educational Telecommunications and Technology, Arizona Department of Education
- **Symposium Goals and Process** - Ms. Janelle E. O'Dell, Executive Director, Arizona Educational and Informational Telecommunications Cooperative (AEITC)
- **Technology Petition** - Ms. Janelle E. O'Dell
- **Keynote Speaker** - Mr. Bob Hughes, Manager of Educational Relations, Boeing Company and Loaned Executive to the Office of the Superintendent of Instruction, State of Washington

THEME: *Technology's Role in the Restructured School ... A Business Perspective*

Thursday, September 30, 1993

6:45 - 7:45 AM **Breakfast** - San Marcos Ballroom Foyer

7:30 - 10:00 AM **Registration** - San Marcos Ballroom Foyer

8:00 - 9:45 AM **Opening Plenary Session** - San Marcos Ballroom

- **Welcome** - Dr. Frank Besnette, Executive Director, Arizona Board of Regents
- **Introductions and Panel Moderator** - Dr. William Lewis, Vice Provost, Information Technology, Arizona State University
- **Keynote Panel** - THEME: *Telecommunications Efforts in Arizona (15 minutes each)*

  Education - Ms. C. Diane Bishop, Superintendent of Public Instruction, Arizona Department of Education

  Business and Industry - Ms. Charlotte I. Frederick, Vice President, Digital Equipment Corporation

  Government/Military - Mr. Edward V. Hatler, Chief Information Officer, Arizona Department of Administration, Information Services Division

Thursday, September 30, 1993 (continued)

Community Organizations - Ms. Nancy Cummings, President, Arizona State Library Association and Director, Yuma County Library District

- **Technology Petition Results** - Ms. Janelle E. O'Dell

9:45 - 10:00 AM **Break and Refreshments** - Second Floor Meeting Rooms

10:00 - 11:45 AM **Policy Development Seminars** - Second Floor Meeting Rooms

Session I

- Strands A, B, C, and D Meet Concurrently for Discussion of Keynote Panelists' Presentations and to Identify Telecommunications Issues and Policy Recommendations

11:45 AM **Conclusion of Session I**

12:00 - 1:45 PM **Luncheon and Keynote Panel** - San Marcos Ballroom

- **Welcome** - Dr. Robert J. McKenzie, Superintendent, Round Valley Unified District No. 10
- **Introductions** - Mr. Gil Gonzalez, Director, Information and Library Services, Maricopa Community Colleges
- **Symposium Progress Report** - Ms. Janelle E. O'Dell
- **Keynote Speaker** - The Honorable Jeff Bingaman, United States Senator, New Mexico (pre-taped video)

THEME: *National and Regional Implications of The Technology Act of 1993*

- **Keynote Speaker** - Ms. Mitzi Lewison, Language Arts Content Director, GALAXY Network

THEME: *The GALAXY Classroom: A Model for Telecommunications Partnerships in the 21st Century*

2:00 - 5:00 PM **Policy Development Seminars** - Second Floor Meeting Rooms

Session II

- Strands A, B, C, and D Continue to Meet Concurrently to Prioritize and Build Issues and Policy Recommendations

3:00 - 3:15 PM **Break and Refreshments** - Second Floor Meeting Rooms

5:00 PM **Conclusion of Session II**

5:30 - 6:45 PM **No-Host Reception** - Fountain Pool

Thursday, September 30, 1993 (continued)

7:00 PM **Dinner and Keynote Address** - San Marcos Ballroom

- **Welcome** - Mr. Paul Kessel, Associate Dean, Instructional Services, Mohave Community College
- **Introductions** - Dr. Arthur Ashton, Special Assistant for Strategic Planning, Arizona Board of Regents
- **Keynote Speaker** - Mr. Marshall E. Allen, Director, The Institute for Telecommunications, Oklahoma State University

THEME: *Perspectives on Telecommunications Integration and the Roles of Education, Business and Industry, Government, and Military in the 21st Century*

Friday, October 1, 1993 Telecommunications Day

6:45 - 7:45 AM **Breakfast** - San Marcos Ballroom Foyer

8:00 - 9:30 AM **Plenary Session** - San Marcos Ballroom

- **Welcome** - Dr. William R. Noyes, Associate Vice President of Academic Affairs, The University of Arizona
- **Introductions and Panel Moderator** - Mr. Hank Stabler, Director of Information Management and Technology, Peoria Unified School District No. 11
- **Technology Panel** - AEITC: A Statewide Network of Networks

  Arizona Department of Education - Ms. Kathryn Kilroy, State Director for Educational Telecommunications and Technology

  Arizona's Community Colleges - Mr. Paul Kessel, Associate Dean, Instructional Services, Mohave Community College

  Arizona Department of Administration and Other Government Entities - Mr. Edward V. Hatler, Chief Information Officer, Arizona Department of Administration, Information Services Division

  Arizona's Universities - Ms. Elizabeth Craft, Director, Distance Learning Technology, Arizona State University

- **Symposium Update** - Ms. Janelle E. O'Dell
- **If You Build It, We Will Come!** - The Results of the Telecommunications Petition

Friday, October 1, 1993 (continued)

9:15 **Keynote Speaker** - The Honorable Fife Symington, Governor

9:45 - 11:30 AM **Policy Development Seminars** - Second Floor Meeting Rooms

Session III

- Final Concurrent Session of Strands A, B, C, and D, to Develop and Draft Policy Recommendations for Presentation at the Afternoon Plenary Session.

10:00 - 10:15 AM **No Break; Refreshments Available**

11:30 AM **Conclusion of Session III**

11:45 - 1:00 PM **Luncheon and Keynote Address** - San Marcos Ballroom

- **Welcome** - Ms. Elizabeth Craft, Director, Distance Learning Technology, Arizona State University
- **Introductions** - Mr. Edward Groenhout, Assistant Vice President, Educational Systems Development, Northern Arizona University
- **Keynote Speaker** - The Honorable Dennis DeConcini, U. S. Senator, Arizona (pre-taped video)
- **Keynote Speaker** - The Honorable John McCain, U. S. Senator, Arizona (pre-taped video)

1:00 - 3:00 PM **Final Policy Recommendations Plenary Session** - San Marcos Ballroom

Chairperson - Mr. Edward Groenhout

- Strands A, B, C, and D Report Program and Policy Recommendations for Debate, Consensus & Adoption
- **Summation and Closing Remarks** - Ms. Janelle E. O'Dell, Executive Director, AEITC

The Arizona Telecommunications Issues and Policy Symposium

STRAND A*: *Education — The Gloria Swanson Room

Public and Private Pre-Kindergarten to High School; Community College; Adult, Basic and Continuing Education; Vocational Training; Colleges and Universities

Co-Facilitators:

- Dr. Carolynne A. O'Donnell, Assistant Dean, Community Programs and Telecommunications, Yavapai College
- Ms. Kathryn Kilroy, State Director for Educational Telecommunications and Technology, Arizona Department of Education

STRAND B*: *Business and Industry — The Joan Crawford Room

Private Companies and Corporations; Professional Associations

Co-Facilitators:

- Mr. Ron Trasente, Vice President, Information Systems, Space and Aviation Systems, Honeywell, Inc.
- Mr. Paul Kessel, Associate Dean, Instructional Services, Mohave Community College

Recorder:

- Mr. Todd Lutz, Director of Communications and Instructional Networks, Mohave Community College

STRAND C*: *Government and Military — The Jimmy Stewart Room

Local, County, State, and Federal Government and Military Agencies and Departments

Co-Facilitators:

- Mr. Edward V. Hatler, Chief Information Officer, Arizona Department of Administration, Information Services Division
- Ms. Jan Baltzer, Director, Computing & Communications, Maricopa Community Colleges

Recorder:

- Ms. Diana Sandy, Administrative Support Supervisor, Arizona Department of Administration, Data Management Division

STRAND D*: *Community Organizations — The Bing Crosby Room

Any Private or Public Entities with Telecommunications Interests

Co-Facilitators:

- Dr. William R. Noyes, Associate Vice President of Academic Affairs, The University of Arizona
- Mr. Tony Miele, Division Director, Library Extension Division, Library Archives and Public Records

Recorder:

- Ms. Lorre Levy, Administrative Secretary, Library Extension Division, Library Archives and Public Records

APPENDIX D

PROCEEDINGS FROM THE ARIZONA TELECOMMUNICATIONS ISSUES AND POLICY SYMPOSIUM PROGRAM

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1. Highlights from Wednesday, September 29, 1993

a. Opening Statements and Introductions

Theme: Technology's Role in the Restructured School...A Business Perspective

Welcome: *Dr. Don Puyear, Executive Director, Arizona Community College Board and Board of Directors Member, Arizona Educational and Informational Telecommunications Cooperative (AEITC)*

Ladies and gentlemen, good evening. May I have your attention for just a few minutes please? It is really a distinct pleasure to be with you and to have the honor of opening this session of The Arizona Telecommunications Issues and Policy Symposium. I congratulate the Arizona Educational and Informational Telecommunications Cooperative and Ms. Janelle O'Dell, the Executive Director, for the fine work that has gone into putting together this symposium.

Our theme for this session is Perspective on Telecommunications Integration and the Roles of Education, Business and Industry, Government and Military in the 21st Century. At harmony with AEITC, Arizona Community Colleges are heavily engaged in cooperative planning and development of educational and informational telecommunications in Arizona. The colleges are setting the pace and providing student and public access to education delivered by telecommunications. However, we don't have the resources to meet the challenges identified in a recent enrollment growth study extending through the years 2010. We look to this symposium and the experience of the Telecom*100, and to each of you, to explore ways of working together to meet these formidable needs of tomorrow. Peter Drucker emphasized the importance of vision, creativity, and forward planning and their impact on future success. He states the relevant question is not "What shall we do tomorrow?," but "What shall we do today to prepare for tomorrow?" and this may well be our charge for the next two days.

My final and very pleasant task is to introduce the person who will make the official introductions for this session. Kathryn Kilroy is the State Director for Educational Telecommunications and Technology for the Arizona Department of Education. Kathryn is one of the founders for AEITC and is currently serving her second term as Chairperson of the Operating Committee. Kathryn serves as an assistant to Diane Bishop in her position as Chairperson of the Board of Directors of AEITC. Kathryn is one of the very few people that can legitimately take credit or blame, as the case may be. I think it's going to be credit for this organization and the progress it's making and this symposium. Kathryn it's a real pleasure to introduce you.

Introductions: *Ms. Kathryn Kilroy, Deputy Associate Superintendent for Educational Technology and Telecommunications, Arizona Department of Education and Chair, Arizona Educational and Informational Telecommunications Cooperative (AEITC)*

Thank you, Dr. Puyear. I would like to make a few announcements. You notice on your original programs that you have Major General Stewart listed as our keynote speaker this evening and you notice in your program tonight that Bob Hughes will be our speaker. Major General Stewart was called away to Washington and I guess, when that occurs, you don't say no. We did some fast shuffling and Bob was very gracious to accommodate us this evening and we're very pleased that occurred. I'll introduce him this evening as well. We also had a message we want you to know from the Vice President. He expressed his regrets, but he wished us well in what we're about to undertake and I'm sure he'll be hearing from us in the

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future should anything occur in Congress that will help this effort. We also have in our audience, I hope by now, Representative Andy Nichols. If not, I just want you to know that he will be joining us. He does serve in our State Legislature. He's from the Tucson area. We are very pleased that he is with us tonight. We have another AEITC board member in our audience that I'd like to introduce, Dr. McKenzie, from Round Valley School District.

Now I would like to introduce to you Janelle. Many of you, I'm sure, have greeted her this evening when you came in and registered. You probably talked to her on the phone at some time or other. She's fairly new to our organization. In July of this year, we were fortunate enough to secure Janelle as our Executive Director. Janelle previously served as a consultant to the Office of Chief of Staff at the Pentagon. She also served as a consultant for the Community Learning Network in Washington, D.C. and the University of the World. She was most recently employed by the University of Arizona at the Office of Academic Affairs as a Program Development Specialist. We're very fortunate to have her. She's a tremendous asset to the organization. She has great organizational skills. We wouldn't have been able to pull this off without that ability on her part.

Symposium Goals and Process: *Ms. Janelle O'Dell, Executive Director, Arizona Educational and Informational Telecommunications Cooperative (AEITC)*

I'm very glad to have you here tonight. I am tasked to explain to you the various goals that we have for the symposium. There are a few:

- One is to host an open forum for telecommunications discussions, planning and cooperation.
- The second is to bring together people from business and industry, education, government, military, civic organizations, libraries, and other organizations from around the state to sketch the beginnings of an action plan or least to recommend steps for an action plan and for moving Arizona into the 21st century.
- The third is to provide you with a glimpse of a few of the many telecommunications activities that are presently going on in the state. Among those are AZTEL 2000 under the direction of Mr. Edward Hatler. One of the many tasks the AZTEL 2000 is undertaking is the technology survey. And rather than confuse the state and you with too many surveys all at one time, we have decided to forego our technology petition which you see in your program. Many AEITC members are part of the AZTEL 2000 effort and so you will probably be receiving in the mail, a telecommunications survey from Mr. Hatler's office and AZTEL 2000 sometime in the future. Another very important activity in the state is GSPED. It is a state wide economic development effort which strongly endorses an information infrastructure across the state. In fact, we're glad to know they are meeting Friday. And we anticipate that their results and ours will lead the state to a very fruitful beginning for the year 2000. Another group that will speak to you will be the state librarians. They have recently completed a very important telecommunications network and they will be talking to you about that. Other speakers include our guest tonight, Bob Hughes from Washington. We also have a speaker from California and one from Oklahoma. They will describe to you a whole host of important programs, partnerships, and visions for the future.

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- The final goal that we have is to present a forum for you to meet AEITC and to get to know us better. Many of us here in this room are members of AEITC, and I would invite any of you who would like to join with the organization to do so.

The next thing I want to talk to you about is the symposium process itself. We've tried to design a process which will allow you to speak your mind, develop concrete recommendations, and build consensus among you, the Telecom*100. The facilitators have attended training sessions and they are prepared to moderate the strand sessions and keep accurate proceeding records of the strand discussions. Not to be overlooked are the reporters who will be in the four strands and without them our work would not be complete. We thank all 12 of those individuals who will be spending a great deal of time on all of our behalf.

Now, what about the expected outcome? There are no expected outcomes that are specific. We know it will be very worthwhile, but we have not tried to design a process that will have any outcome that's just to our liking. You will decide the outcome. However, the geographical diversity, the professional expertise, and the enthusiasm of Telecom*100 will undoubtedly provide us with a rich and broad spectrum of recommendations on Friday afternoon. Friday will be a very exciting day. It is Telecommunications Day. We'll have a number of speakers and taped addresses from both of our Senators McCain and DeConcini. I want to thank you very much for attending and if there is any way I or my staff may make this symposium more constructive or cooperative, please let me know. And now, enjoy your dinner.

Kathryn Kilroy introducing Bob Hughes.

I've seen Bob Hughes present before and I know he uses a lot of technology to do his presentations and you'll see that this evening. It's my pleasure to introduce to you our keynote speaker this evening. As I mentioned, Bob is not new to this state. He's been here several times before both for work and pleasure. We talked a little about that at our table. Bob is with Boeing and has been on loan to education by Boeing for a number of years now. He plays a significant role in the state of Washington in helping schools and the educational environments there in business and industry in developing technology plans and going forward and implementing them for education and on behalf of education. Though he is on loan, he seems to be very active and has traveled extensively in the last 5 years doing speaking engagements around the country. I just happened to pick up a newsletter today and there was Bob Hughes' name not only on one page but two. As you hear him present this evening you'll understand why in one of those articles they called him the "Gadget Guru." It fits him.

His message always is very apropos, I feel, for almost anyone who's listening to him. I know that our audience this evening contains not only educators but people from all walks of life. I think if you hear his remarks you'll be able to apply them personally and maybe even in your own personal life and most assuredly in your work life. So, won't you help me welcome, Bob Hughes.

b. Excerpts from Bob Hughes' Speech

Keynote Speaker: *Bob Hughes, Manager of Educational Relations, Boeing Company and Loaned Executive to the Office of the Superintendent of Instruction, State of Washington*

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Thank you, I'm absolutely delighted to be here. The state of Washington is struggling with a number of the same issues you are. I was very anxious to see how you were managing to pull this group together because the real foot soldiers of change are right here in the room. If things are going to change it's going to be people here. My background and time that I spend is all education.

I got a call one day from the Chairman of the Board of Boeing. I had joined a school board. I found out, almost immediately, that being on a school board does not help your career at all. Like most companies, the Boeing Company treats school board positions, because they are non-paid, as having very little value. If you wanted to go to a conference like this, you had to take a vacation to attend. I was busy using my vacation, trying to explain to my boss why I would or wouldn't be somewhere because of conflicts of meetings and so on. I picked up the phone one day and on the other end of phone was the Chairman of the Board of the Boeing Company, a guy named T. A. Wilson. He said, "Hi, this is T." I said "Sure, I'm Santa Claus, who is this really?" After I got over that shock. Scared me and my boss half to death. You know, 160,000 employees and the Chairman of the Board was talking to me. He said that he had just joined an organization called the Washington Round Table. It was composed of thirty-two corporations. When the Chairman of the Board from each of those corporations got together and talked about things they could do to help the state, there was a tremendous amount of disagreement. The one thing they agreed on was the value, to all of them, of education. T. Wilson was asked to form a subcommittee of loaned executives, if you will, to look at education. He went back to his corporate structure and asked, "Who do we have involved in education?" Fifteen other corporations did about the same. He told me he had gone to personnel (human resources). They fired up their computers and searched them for three days and came back and said, "Beats me. We don't track that; should we?" And purely by word of mouth they contacted people who were on school boards. In fact, a good friend of mine was on the State Board of Education and knew that I was on another board. We all ended up meeting with the Chairman of the Board on the subject of education. We all were offered various opportunities to get involved in education and study some of the issues facing education.

I have to tell you frankly that we started with some sixty different issues. We started with what you call, education bashing, a lot of what I've seen around the country. We've progressed far beyond education bashing and I think we're starting to look now at the changes that are going on in all parts of the country in the social structures and how it is impacting business. How it is impacting education and competition. I want to share some of that with you and how critical all of us working together is. We looked at the sixty issues. We looked at higher ed; we looked at teacher pay structures. We looked at social structures, teacher ratios, teacher preparation, class ratios. We looked at all kinds of things. We narrowed it down to about twenty key issues. And assigned an executive to each one of those issues where they spent three months to a year just gathering data. We found out there are enormous amounts of data and very little information. We had to sort through masses of reports to try to figure out what was really happening. I'm not sure you ever get it all. We looked at higher ed and discovered, almost up front, that we may have a lot of concerns with higher ed. The fact is, world-wide, it's world class. If you don't get into Tokyo University in Japan, for instance, more than likely, you're going to come to the United States to our university system. Even though we spent time there trying to figure out what to do in our state on what to lobby and what to push, we then began looking at K12, where 75% of America goes flowing through the K12 system and becomes part of the work force of the future.

We began asking some questions: "How well are they preparing people to be successful, to fit in, to meet the challenges that we are facing? And believe me, we're facing them. Right now

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the Boeing Company is the nation's largest export. Two-thirds of our customers are outside of the United States. Our largest competitor today is no longer a U.S. firm. It's Airbus out of Europe. We began asking questions about a level playing field. Airbus is being subsidized by four countries to the tune of right close to $5 billion a year. We're trying to compete with them and it's making it tough. We looked at the way they hire kids. And the kinds of kids that come into Airbus, for instance. That come into IBM, Europe. Texas Instruments, Japan versus the ones in Texas that are hired off the street. Texas Instruments told us that they had a clean room in Texas that was exactly like the one in Japan. The requirement in Texas, to be hired entry level into that clean room, was two years technical school or two years of college. They appreciated technical school more. In Japan, the same job, the same clean room was right off the street high school graduate. So they were seeing a, roughly, two years difference in the work force preparation. They felt it affected them. IBM had similar stories. After we studied the issues, brought them down to twenty, analyzed those, I would have to tell you that today we're down to about two issues.

The first one, very clearly, kids today are coming to school less prepared than they ever had before. It isn't all kids; it's really interesting how it's occurring. In fact, it's almost a random number. One of the statistics we discovered was that one of the best predictors of a drop-out in this country is a fifth grade teachers opinion. But, nobody listens. In fact, IBM is doing a study on that in Austin, Texas, trying to quantify teachers opinions as they go around the room. In fact, they have random selections. What we call our "at risk kids" are not always the ones that the teacher points to. And they have a different reason for each kid. When I say kids are coming to school less prepared, that's probably being kind. In many of the schools that I have visited, I have begun to see kids not only less prepared but they're bringing baggage with them. The like of which principals and teachers have never seen before. I'm starting to see elementary schools today with, not only more counselors, nurses, but more kitchen facilities, washer and dryer facilities, showers. So schools are facing some very interesting challenges with the way kids are coming to school. Of the problems that we're working on in Washington State, that's probably the toughest. Looking at the social changes going on and the way kids are prepared or not prepared. It doesn't matter where you are, whether you're on the coast. They're just simply, not ready to learn.

Problem number two. Quite frankly, we discovered that the world kids are going into today, is requiring more and more preparation. That's where I think, most of the people in this room spend their life. I think you can see that every bit as well as I can. You can see the changes that are occurring. Some examples I'd like to share with you are, very simply, around how the world's changed say in the last 100 years. You think back 100 years or you meet people that are 100 years old today. We've got kids being born today that are going to be living in the 22nd century. They're easily going to be around 100 years from now. Can you imagine the change that will occur? In this last 100 years, the airplane was invented and now we're shooting rockets past various planets. The motion picture was invented less than 100 years ago and now we can watch live what's going on in another part of the world. If you take almost any profession, and say as even as recent as 50 years ago. My granddad was a doctor, you walk him into a hospital today, even into an RN station, he would not recognize the tools that a nurse uses today. You can take any profession and see that. Lawyers in offices, office workers, factory workers. The only profession it isn't true in is education. You can take a teacher from 50 years ago or even 100 years ago and if Rip Van Winkle woke up today, he would be most comfortable in our schools.

We had a situation where we wanted to help schools do strategic planning. We brought in retired executives, people who are used to doing change in their organization, keeping them current. They're retired now. They volunteer their time. They come back into Boeing and we

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put them through a couple of days of training on strategic planning. To kind of refresh their memory. We put them back into schools and they tell us they are very uncomfortable coming back to Boeing. There have been so many changes in the work place in the last couple years, they are uncomfortable. Work methods, work groups, the mixtures of people, the cultures, the genders, and so on. They're all drastically different. They then go out to a school and do strategic planning and they're right at home. They have visions of their youth and how that school operates. They are trying to help those people understand that they are preparing kids for a future that's absolutely exploding in activity.

We bring teachers in, for instance, during the summer. We show them the workplace. We bring in about sixty teachers every summer, spend about six weeks. We pay their salaries. A guy handed me a note from one of them and it said, the note was written back to the principal in the building, the teacher said in the note:

> "Dear Principal,
> I've been here at Boeing one day and I already have a computer and a telephone. The computer is better than anything I've seen in my building. It allows me through Internet to send mail to almost anybody in the world and receive it back again, free of charge. The telephone allows me to talk to anyone in the world and I don't have to get my principal's permission to use it. I've been here at Boeing one day and I've been at school 8 years. I think I'll stay here."

The sad thing that hit us, this particular teacher could not even go back to the classroom and simulate the world that those kids were supposed to be being prepared to go into. They couldn't even simulate it. They just don't have the equipment and the understanding of the importance of that equipment. You can see where the challenge is in the teaching profession.

In fact, the question came up, I had a real unique opportunity a couple months ago to spend two days at George Lucas' Skywalker Ranch. He opened up a new education foundation. He is absolutely frustrated with the level of education in this country. In fact, part of the reason he stated was, "some of the best , absolutely the best, videotography people, audio people, that he has been able to hire can prove that they have been rejected by our university system. They just did not cut it in our schools. But yet, they are gifted individuals in their own right." He thinks something's wrong. He opened an education foundation. He's trying to build some videotapes now that would show people, visually, what the world in the year 2020, might look like, hypothetically. He's doing research on that. He's flying people in. In the two days that I was there, we got into a lot of discussions. There were about 12 people at the particular session I was at. One of the discussions dealt with a glimpse of the future. Have there ever been periods of time in history that are similar to what we're looking at today? Can we learn anything from the past? Allen Cave was there. One of the inventors of the mouse. He was with the Xerox Park and they came up with, initially, the mouse concept. He related a story about the printing press that really fascinated me. In fact, you go back into the 1450's, right about the time Gutenberg invented the printing press and you'll see a period in history very similar to what we're facing right now, in terms of information explosion.

Just prior to that, I had a chance, Sony gave me a toy that they were Beta testing. This is a little DiscMan. In fact, it has CD ROM's in it. You can put CD's, like audio CD's. I have, in this particular case, 'A Guide to America: A Traveler's Guide.' I can put different CD ROM's in here. Read them and carry them around in a backpack. I've three or four of them with me. One of them is 'Old Yellow Pages in the US.' There're encyclopedias; there're famous quotes, travel guides, those kind of things. You can pop them up. There are books they'll read to

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you. There are video clips on some of them so they'll play music you can listen to. It's just like flipping through a book if you had one with you. The difference is a school library, when you open a new building, a new school, typically you have somewhere between 8 and 10 thousand books the day it opens. I can get 10 thousand books on CD ROM today and put them into a box about the size of a shoe box. I can carry around the library in my backpack.

This is the kind of information flow we're looking at for the future. How does a teacher deal with this? How does a teacher explain to kids that data does not make information? And, information doesn't make knowledge. You've got to really work at it to find what you want.

How many of you ever been to the Huntington Library? It turns out, the Huntingtons were owners of Southern Pacific Railway. When they passed on, they had an ancient book collection, which essentially became the library. For about ten bucks you can go through that. And this (discman) little thing explained where it was. When you walk into the Huntington Library, right in the entry way, is a Bible, that's under glass. It was one of the very first books that came off of the Gutenberg Press in the 1450's. 1452 in fact. It was made to look like the handwritten bibles that preceded it. In fact, right next to it is a handwritten Bible that was owned by the King of England. It was commissioned by monks and scribes to be written in Latin. Both these books look the same Both of them, they're huge documents, they're about 50 pounds. They came in two volumes, written in Latin. Great big calligraphy. Written on a sheep skin. Enormously expensive to produce in the handwritten form. You had to train people Latin. You had to house them. You had to, basically, it's extremely expensive to hand write them. Well, here all of a sudden, the printing press. We could start stamping out these books much quicker. And the price dropped and all of a sudden people started to have the Bible. Well, the church didn't like that. The aristocracy didn't like that. All of a sudden, people had information. Peasants began to form opinions. As soon as you started getting books, it wasn't only the Bible that was popular. We had the Iliad, the Odyssey, Socrates, and all kinds of philosophers. In fact, as you go through the library, it's like a pyramid. You don't see very many books up to 1452. And then, there is an explosion of books. You see the Canterbury Tales, Shakespeare, you see original copies of things. Some, the only copies in the world known. There was an explosion of information that began to occur. When you read about the Bible, you find that it was the most popular document. In fact, churches, in the 1400's, were measured a number of different ways. One of the ways they were measured was, "How many copies of the Bible do you own?" It was an indication of wealth. The King of England and the Church of England had 120 copies of the Bible. They were 50 pounds each. They each had a desk devoted to the Bible. And, it was chained to the desk. You had to get permission to come in to read the Bible. You had to know and prove that you know how to read Latin. That reminds you of a computer lab at school. We are going through some parallels today. When the books began to distribute to the peasants, the peasants started to do home schooling. They started to say, 'why should I wait for somebody to nominate me to learn how to read, when we could all get together and learn how to read together.' There were three people that literally had a price on their head. Two of which were burned at the stake for handing out literature to the peasants. It was just something where the aristocracy didn't want peasants to have opinions. Oliver Cromwell led the peasant revolt over the King of England because they didn't deal with the peasants that had opinions. New forms of government literally began to form, out of the information flow that began to occur. Decision making began to drop because at the same time, the printing press technology was invented in Germany.

The Renaissance was beginning in Italy and the printing press, did not cause the Renaissance, but it facilitated information flow. It facilitated opinions of the peasants. Once peasants have opinions, you have to deal with them. And the new forms of government began to emerge that

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simply lowered decision making. Democracy, many people would categorize, as a way for masses of people to carry on a conversation or a debate, emerged out of that.

Today, obviously, it isn't the printing press we're seeing in this flow. It's other things. It's satellite communications, cellular telephones, digital information and computers, video tapes. My boss does not know where I am today. He doesn't have to. I have a paging system that will reach me anywhere in the United States. I've got a cellular phone. I've got a deal with him, that every time he pages me, I'll call him back within three minutes. Wherever I am and wherever he is, I don't know, the pager says what area code to call. I've got a fax built into my portable computer. There's no reason for him to know where I am. We're out doing our jobs.

So, the world has changed. And, the world the kids are growing into is one that they need to understand and be prepared for. The teaching profession is not able to understand the world effectively. But it's beginning to. They're beginning to see some of this through lectures you can get to them and explain it to them. There are all kinds of methods, forums like this. And, they're needing more and more tools. Teachers are trying to react.

What I have covered to this point is two problems. Kids are coming to school less prepared. That maybe a social issue, I don't know. There are a lot of causes for it. There are a lot of solutions. Many school districts right now, the Boeing Company is partnered with about 40 school districts in four states. Mostly where we have major facilities. Pennsylvania, Huntsville, Kansas, and Washington. Midwest districts, Huntsville are trying to re-implement the family, if you will. Dan Quayle was right . I don't know what you want to call it. If parents understand their role, they will get back in and make sure kids are coming to school.

We had a partnership with GTE and IBM in allowing employees to take a couple of days off during the year. Or, take four hours a week off and go into schools. I'm on a school board, been on a school board now about 15 years. Currently president of the school board. We had a little ceremony in our district for all the employees from those three companies, Boeing, GTE, and IBM. We probably had 300 employees in the room along with teachers. We asked some of them to come up to the microphone and describe their experience of what they did trying to help kids. I was really amazed. One woman came up, 26 years old, and said:

> "You know, I probably got married too soon, but I did. I find myself now, 26 years old, a single parent, working full time to make ends meet. I've got a little 5 year old son and I'll tell you that between trying to work and trying to shop and take care of things, I can spend about ten minutes of quality time a day with my son." And they're drifting apart. And she knew it. She says she's "been searching for ways to keep my family together, but I can just see the communication between me and my son becoming worse and worse." She said this program allowed her to take four hours off a week and join her son's kindergarten class. "Now, there are 27 kids in the class, in fact, I'm helping the teacher with these kindergarten kids and I'm also able to help my son. It's really great, because when we go out shopping to Safeway now and I put him in the cart and go around through Safeway for the first time in a long, long time, we talk about his friends and his life and I know all of his friends. This program is allowing me to bring my family together. When I first read the notice about the program, it came around through and hit my desk. I read it and sat there at my desk and I cried. I knew that it was going to be that important to me."

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There are lots of people, for no reason of their own, who are in predicaments that are causing their kids to be at risk. They know it, but they don't know how to get out of it. There are others, my school district has Microsoft right inside the boundaries, it has Nintendo in the boundaries. In fact, at Microsoft, 1 out of every 5 employees is a millionaire. We have sort of an extreme mix that we deal with. I got a letter from one of the Microsoft folks who is President of the Board who was chewing me out because our schools were going to close at noon once a month and do some planning, strategic planning, planning for the future and so on. It basically said:

> "I've got two kids in the middle school, two boys, my wife and I leave for work at 7 in the morning. You start school at 8:30. We have to worry about the kids from 7 to 8:30 and hope when they go out the front door, they lock it. Then, you let school out at 3:30 and my wife and I don't get home until 6. We've got to worry about those kids from 3:30 to 6. Now, you want to close school once a month at noon. So that we have to worry about them from noon to six."

More kids at risk because of the changing in attitudes. Those are two, entirely different social economic structures and the kids are at risk. That's what teachers are having to deal with. On the other hand, there are teachers now who are inventors. There are teachers looking at these kids. They're looking at the world they're going into. They're beginning to question how we teach school. Al Shanker said:

> "What we have in America today, are 30 little workers that walk into a room for 55 minutes. They have a boss and they all work on the same problem, simultaneously. They can't talk to each other. Then the bell rings. The 30 little workers go to another room. They have a different boss. They work on another problem simultaneously, unrelated to the first problem. Again, they can't talk to each other."

Al Shanker is the head of the American Teachers Federation out of Washington, D.C. part of AFL/CIO. That's the last time those kids will ever see that model, unless they go to college. The workforce is changing. We're seeing much more independence. We're seeing people lowering the decision making. At the same time, technology is being invented in the United States, Japan, and Europe. Deming created a renaissance in decision-making. We're beginning to lower decision making. We're allowing work groups to make more decisions just like in 1452. We're seeing new forms of decision making emerge because of these tools. People are much more independent. They have more time.

Look at what IBM is up against. Anybody ever hear of Domino's Computers? Domino's, last year, had two branches in California. This year, they're up to 27. Domino's is a kind of a company where you walk in to one of their branches, four hours later, you walk out, and you have just built your own computer. You put it together yourself. In fact, I went in to one in Sacramento, the first thing they do is assign a kid to you. The kid walks you through 18 different workstations. The first one is picking out a motherboard. And they explain all options. Then you go through a chipset workstation. You pick out any number of chipsets. Then, a CPU station. Then, a mouse station. Got 15 different mices to choose from. Then, a monitor station. Then, a box. Pretty soon, about an hour later, you've got this big pile of parts on a table and a screwdriver. And the kid's saying, "Put this in here. I'll be back in 10 minutes." After about two more hours, putting this in here and screwing this together, they try to load Windows. If it runs, they'll warrant it for a year. Sacramento High School is sending high school kids up there to build computers for the elementary school. You know, cutting

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costs. And you really get bonded with your machine. You just kind of fall in love with this thing. You know, all the pieces and parts. That's the kind of competition that people are running into. The creativity that is coming out of the worker at the lower level. The new ways of instilling quality. Continuous quality improvement. And using some of these tools as fast as they are coming out. Figuring out which ones work, which ones didn't, which vendors are supporting.

We've got teachers today, that are trying to do the same thing. They're trying to monitor that. There are a number of examples across they country I could show you, but I've got a couple of video tapes that could give you some ideas. This first one is a guy named Chris Held. He is a fourth and a fifth grade teacher, for example. I kind of want to work my way up the grade levels. Chris, as you can see, is not the kind of teacher who stands up in the front of the room and lectures. He has fourth and fifth graders mixed. Kids work on projects. As you can see up here on the chart, he says, "I used to teach the way it is on the left, but now I teach the way it is on the right." Instead of having individual subjects, 55 minute periods, with bell ringing in between, he basically has projects. The kids form teams. They pick what the project is. You get extra points when you make a team or company(sometimes he calls them a company), if you have mixed genders in your company. You get extra points if what you turned in is turned in in two languages. I don't care how you get the languages. It makes the Cambodians down the street real popular. Or the ESL kids. It's a lot of fun for the kids. You get extra points if what is turned in is in multimedia. Where you videotape something, you don't just write it. You use word processors. You draw your own art work.

He modeled this, in fact, he was reading a book called The Scans Report put out by the Department of Labor. If you haven't seen one, it's a good example. Here's how businesses change. Here is how schools ought to change. It was directed at teachers by the Department of Labor. You need to update the way you teach kids. So he modeled the same way. He said, "I used to have individual projects, used to use books. Now I use magazines, databases, the Internet. I use all kinds of tools today. You've got three different pages of how he used to do this. Let's look at some of the works. There's probably close to two hundred classrooms in his district alone. It's a fairly large school district, about 15,000 kids. Two hundred classrooms is not a majority. Some of the teachers are beginning to teach differently.

This example came from another school district, Black Diamond, another one of our partner districts. The kids were studying whales. There were five kids on the team. They were pulling images off of a National Geographic disk, off television. They drew some of their own pictures. They discovered how to put their own music on it. They discovered on their own something called storyboarding. They actually had to film it about eight times because their storyboard wasn't accurate. I just wanted to show you they learned about editing in that class. There's probably close to 100 of these videos coming out of classrooms every week. Kids are developing different ways to display information. There are teachers that are changing. You never know when you're going to find them. They pop up like whale sightings.

Here was a high school I walked into and the teacher had started with MIDI instruments, MIDI sound, Casio, Yamaha keyboards hooking them together. Wanted kids to be able to jam together and do Jazz. When I asked him, "what was the tough thing from your point of view?" He says, "I had to change my attitude about my job. Today, I am the chief learner in this room. I have here a community of learner apprentices all around me. We are all trying to keep up with this emerging and changing world." It was very refreshing...that change in attitude.

South Eugene High School in Eugene, Oregon, produces a world class year book. In the back of it is a compact disk. A CD ROM. Everything that is in the yearbook annual is on CD.

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When you get to the pictures of the seniors you can click on them, they're in color, and they come to life. They put a little video clip in there and they explain what they're going to do with their life. It added two dollars to the cost of annual. The nine students who put this together had a very small grant from a couple of local companies to give them Pagemaker, a Mac, in order to do a lot of the things they were doing. The labor was free. Most of the cost was just pressing the CD. There isn't one kid in that high school that owns a Mac with a CD player. All nine of them could get a job at Microsoft.

It becomes a question of, "What are you really in schools for?" Headlines last year at this time, a local paper in the Seattle area, were blasting the City of Victoria, Canada because we had just discovered that they were dumping raw sewage out into the south. They did not have a sewage treatment plant and still don't in Victoria. So, the kids suggested, "why don't we design a sewage treatment plant for the City of Victoria? They obviously need it." The first period got the assignment of going to Victoria and locating some property. They contacted real estate agents. They subscribed to the Victoria newspaper. Priced property to get the right size and so on. The second period class had the job of building a model of the property. Laying it out, designing the model. The third period class designed the main treatment pools, filtering systems, and so on. They ended up working the whole year designing this sewage treatment processing plant. Having experts come in and describing how you do it, what the various parts are, and having the kids involved in it. At the end of the year, they concluded by making a formal presentation of their project, all six periods together, to the Bellevue City Council and school district. They offered it to the City of Victoria, but they didn't want it. They learned international relations, social studies. They got into environmental issues. Debating much more than just "how do you use Auto Cad?" Auto Cad became just a subset of how you do the total job. It was really a dynamic and exciting thing. It has gotten enough attention so now teachers in that building are beginning to ask how can they integrate social studies into these vocational programs.

One last example I want to show you. One friend of mine in California, I ran into three years ago, got an award of IBM's Teacher of the Year. His name is David Masters. He teaches video graphics in Los Angeles. You need to understand that the high school that David Masters is in has about 3600 kids with 18 different languages spoken. It is a very depressed part of Los Angeles. There were three gang killings on the campus last year. He looked around him in L.A. and said, "The largest business near me is Hollywood. What I ought to do is try to get kids jobs in Hollywood." He was an artist in computer graphics. He started showing kids, with software and computers, how you could draw cartoons like Bugs Bunny, Road Runner, the Simpsons. He's up to about 300 students that he deals with right now. Two years ago, he received IBM's Teacher of the Year in Technology and Learning. The reason is, in the last twelve months, there are 12 first run motion pictures today that have had his kids do pieces of the video graphics. Hook, Dracula. In fact, one of his juniors last year was nominated for three Academy Awards. That same kid won an Academy Award for Dracula because he was part of the special effects team of Dracula. He's got another set of kids, a freshmen and a sophomore, that asked a question about The Simpsons. Could you do it a certain way with dummy character instead of drawn characters? He called the studio and asked if they could do it with dummies, these kids want to know. They said absolutely not, you can't do that. Two weeks later, the kids figured out how to do that. He called the studio and said, "my two kids have figured out how to do that." They said, "no, you can't do that." He said, "I'll send you a tape." He sent them a tape. Two days later, $120,000 worth of equipment was delivered to the school. The sophomore was offered a job for $24 an hour working for The Simpsons part time. He just graduated in June and he went to $42 an hour. He is now Sight Supervisor or Production Supervisor of The Simpsons.

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How many of the things that these kids were learning are being tested? And that's what drives our schools. The public's opinion of schools is, keep them the way they've always been. It worked for me, so don't change it. The teachers lost valuable time, in their opinions in learning more of the basics. I'm not a proponent of lowering basics. I'm a proponent of doing more on top of what they've already done. And do it in a way that it is more fun. It attracts kids to come in.

I think what we're seeing is a country that's trying to change from a traditional Henry Ford, style of assembly line to a high performance, lowering of decision making. We're trying to use those tools to make a person try to think at a lower level. We are having an enormous amount of difficulty, at the Boeing Company, trying to do that. The traditions are there. People have worked all of their life to become Plant Manager, Plant Supervisor and the perks that go with it. Lowering the decision making begins to threaten some of those perks. Schools are facing the same thing, plus they're removed. They need to be able to communicate directly with the people in the fast moving jobs in the competitive world. Teachers need to understand it and be able to support it. Teachers need to seriously look at this thing called a C-Time Unit or a Carnegie Unit. Whether you believe it or not, every state in the union has a law that states that if a kid comes to school every day and sits there and is quiet, the worse thing I could do is give him a D. What that means is a C-Time measurement of how some kids work their way through school. We see it when they come into Boeing. They've all got a diploma. There are some extreme difference when it comes to whether they can read or write or do math.

The idea is to move to mastery. In other words, kids go through the system at their own rate. Mastery, to me, is kind of like a driver's test. After a period of learning, you decide when to take the driver license test. It isn't when the teacher says. It's when you decide you're ready to take the test. If you pass the test, it's a worldwide standard. You can drive any where in the world. If you don't pass the test, there's no penalty. You just simply go back and study some more. Some people go through that system quick and others go through it slow and that's ok. Everybody is different in every subject and every task that they try to accomplish. That means we have to get rid of things like the bell-shaped curve. The bell-shaped curve was designed to weed out certain people. We forgot that for every winner, in a bell-shaped curve, there is a corresponding loser. Losers don't get jobs today. We need to move to a system where all kids can learn. They have equitable treatment on how they learn. The future isn't what it used to be for these kids. In fact, I get a kick out of Yogi Berra when he says, "When there is a Y in the road, you should take it."

We have enough time for questions, but not enough for answers. If you have any questions, I'd be happy to respond. I'm very interested in what comes out of this meeting. We're talking about doing something similar in the State of Washington. You are truly, in this endeavor, leading the nation in trying to create good infrastructures to support business, to support schools, and social structures. It recognizes this exploding information base. I applaud what you are doing.

Question: Are you finding schools wanting parents' involvement? My experience has been, get out of my business.

There isn't one answer to that. People are people and there is a mass of teachers. Teachers are used to closing the door and being alone with kids. Somebody new in that room is a threat to many teachers. I am finding with teachers that, once they understand you and your motives, they love having you there. You need to check with them ahead of time. In fact, our partnership where our employees get off for four hours a week, we very carefully ask the

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teacher and principal before we even offer that person and sometimes they have to get to know each other. You just don't know what the motives are of both sides. Teachers are very caring people. They picked that industry because they like people. They remind me of hospitals. I tell you, you'll go to some of the states like California, Florida, Texas. In Dade County, Florida, they have so much immigration, that they were building a new elementary school every week. What I saw was they were commandeering warehouses to set up schools. What I saw were some of the best educators in the country going to where they were needed most. Go to some the most depressed of your cities, and you'll see some of your best educators. They love parent involvement. If you look at the amount of time a kid spends in school, by age 18, only 6% of their time has been spent in schools, the rest has been with parents. What kind of quality that is going to determine how well those kids are prepared, how well they go on. Many of the schools that are opening today are unfortunately finding that they have to be open at six in the morning or have to feed the kids. They have to be open until 10 at night in order to make sure that the kids aren't out with nothing to do. They have to be open on Saturday or Sunday. They have to be open to an extended family. It's real interesting what is going in some parts of our country. The importance of a parent, by educators, I think is thoroughly understood and very open.

Question: Are you seeing a large enthusiasm for what was America 2000? If so, is it a catalyst for a kind of involvement in the community and parents trying to make some changes in education?

Yes, I think what President Bush did was call attention to the issue with America 2000. I think it is extremely fortunate that President Clinton played a key role in America 2000 initially, as part of the Governors' Task Force that established those six goals. The bully pulpit that those two people bring to it has helped an awful lot. The six principles, only four of those national goals really apply to education. Some get into adult literacy, and drugs and alcohol. There are only four. In the National Business Round Table, they have proposed nine characteristics of a successful schools system. We at Boeing have adopted those as kind of a subset, lower level, if you will. The attention that it's focused on it has been invaluable. I think that we're, quite frankly, on the way out of a very big problem. If you look at other countries, like Japan, Europe, in many cases what you see there is that the family is still together. They have not, in Japan for instance, used their Silver Bullet yet and started putting their women into work force. When that begins to happen to them, they'll begin to experience some of the same problems we have. The Horace Mann or Henry Ford style of school where kids run through every 55 minutes when the bell rings will start coming apart at the seams for them too. We are kind of, again, a forerunner of running into problems that other people haven't. The thing that's really exciting is America is full of inventors. I'm seeing teachers step up to the task. You can't predict where an inventor or and invention will be and you can't predict where a teacher is going to have a new idea to do it different. Part of my job is trying to keep track of some of those and share them. They don't share enough of them. Some of the workshops I put on are a series of tapes and toys that I have picked up in schools and share them with other people.

Let me point out that, I can change schools easily. I can get the teachers. I can show them charts and videos. I can get the principals. I know where they live. I know where they work. I know where their conferences are. I know what magazines they read. The hardest thing in education reform is going to be the community and parents. They don't want to change the school they went to. 'Look at me, I'm fine. My kids going to be fine. Just keep it the way it is.' We wanted to change the school. We had an innovative principal at one of our high schools. He wanted to go to 90 minute periods and sometimes hour and a half periods and integrate subjects so that you're studying, say, El Nino. That combines science, social studies, population shifts, deforestation. It gets you into a lot of things. He came to the school board

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with a little ten minute explanation of what he was going to do. That segment of the school board meeting lasted an hour and a half. There were seven parents there, that sounded like seventy in the newspaper the next morning, who objected to changing the time schedule of the school. He told me, afterwards, that changing schools is like trying to move a cemetery. You never what friends the dead have until you try to move them. The seven parents that spoke, not one of them had a kid in that school. They were people who wanted to recreate schools of their youth and not let that school change where they had graduated. The successful programs that I've seen have not been the whole school changing. They have been a school within a school. Like, three teachers get together and they offer a choice. You can elect to go to the traditional school or you can elect to go, in the same building, to a new school that has three hour blocks of time. You don't advertise it to the public, you advertise it to the parents and to the kids. There is one in California that we have been working with, Drake High School, that started with 90 kids three years ago. Just this year, it took over the whole school. It was so much fun for those 90 kids. It had so many rewards that the whole school opted into it. It wasn't dictated, it was elected in. So, it's a perception. People are either pioneers and they'll trail blaze for you, and they don't need a map, and they understand what you said and they'll try it, or people are settlers. They'll do it, but they need a map. They need to see it and know it's safe. We need both. The settlers will go across and produce good products. The one's we don't need are tourists. Thank you.

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SCANS

What Work Requires of Schools

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A SCANS REPORT FOR AMERICA 2000

The Secretary's Commission on Achieving Necessary Skills
U.S. Department of Labor

Characteristics of Today's and Tomorrow's Workplace

Traditional Model	High Perfomance Model
Strategy	
• Mass production	• Flexible production
• Long poduction runs	• Customized production
• Centralized control	• Decentralized control
Production	
• Fixed automation	• Flexible automation
• End-of-the-line quality control	• On-line quality control
• Fragmentation of tasks	• Work teams, multi skilled workers
• Authority vested to supervisor	• Authority delegated to worker
Hiring and Human Resources	
• Labor/management confrontation	• Labor/management cooperation
• Minimal qualifications accepted	• Screening for basic skills abilities
• Workers as a cost	• Workers as an investment
Job Ladders	
• Internal labor market	• Limited internal labor market
• Advancement by seniority	• Advancement by certified skills
Training	
• Minimal for production workers	• Training sessions for everyone
• Specialized for craft workers	• Broader skills sought

* Sources: SCANS report - 1991 US Department of Labor

Bob Hughes (206) 828-6340

Loaned Executive - OSPI/Boeing

7503-117th Ave NE - Kirkland, WA 98033

America's Choice:

high skills
or
low wages

National Center on Education and the Economy
P.O. Box 10670, Rochester, New York 14610 ($18)

Business's Choice:

1. Concert to the new forms of production
or
2. Transfer producation to Taiwan, Singapore, Korea, etc.
or
3. Convert to lower wages or benefits

Major Industries

* Mircro electronics
* Bio technology
* Telecommunications
* Aviation
*Material sciences
* Robotics and machine tools
* Computers and software

High School Retention

	Rank	Dropout %	Teacher Salary	Per Pupil Expend.
Minnesota	#1	9.4	11th	17th
Wyoming	#2	10.7	24th	6th
North Dakota	#3	11.6	46th	37th
Nebraska	#4	13.3	42nd	29th
Montana	#5	13.8	38th	16th
Iowa	#6	13.8	30th	24th
Wisconson	#7	15.6	15th	12th
Ohio	#8	17.2	20th	31st
Kansas	#9	17.9	32nd	21st
Utah	#10	19.4	43rd	50th

Source: Harold Hodgekinson, 1989 Institute for Educational Leadership

High School Retention (con't.)

	Rank	Dropout %	Teacher Salary	Per Pupil Expend.
Florida	#50	41.4	28th	25th
Louisiana	#49	39.9	48th	44th
Michigan	#48	37.6	6th	14th
Georgia	#47	37.5	26th	39th
New York	#46	37.1	3rd	2nd
Arizona	#45	35.6	22nd	35th
Mississippi	#44	35.2	49th	51st
Texas	#43	34.9	27th	38th
California	#42	33.9	5th	30th
Alaska	#41	33.3	1st	1st

Source: Harold Hodgekinson, 1989 Institute for Educational Leadership

Scientific American - Feb. 1992

- Asian migrants from 1985 & on.

- Proving that schools are just fine if...

Chris Held's Classroom

Traditional	Future
Individual subjects	Projects, Integrated Learning
Spelling, grammar, language, reading, competition	Whole Language and the Writing Process (draft, edit and publish)
Textbooks	Newspapers, magazines, data bases video discs
Math algorithms	Exploration in Mathland, manipulatives, LOGO, simulations
Pencil and paper	Word processing, laptops, desktop publishing
Single-grade class	Multi-grade or mixed-grade classes
Kids leave room for help	Special help comes to kids
Report cards	Parent-teacher-student conferences
Teacher-selected learning	Student-teacher-parent selected learning
Memorizing	Understanding
Quiet, at desk	Talking, moving around
Curriculum-centered model	Child-centered model
Abstract	Concrete, connecting, then abstract
Work and learn alone	Work cooperatively
Hands-off	Hands-on
Teacher's rule	Class rules
Board and/or anxious students	Excited and motivated students
The teacher is a sage on the stage.	The teachers is a guide on the side

Chris Held, teacher, Phantom Lake Elementary, Bellevue, WA.

Change

- Traditional TO High Performance
- Carnegie Units TO Mastery
- Bell Shaped Curve TO All Kids Can Learn

2. Highlights from Thursday, September 30, 1993

a. Excerpts from C. Diane Bishop's Speech

Welcome:	*Dr. Frank Besnette, Executive Director, Arizona Board of Regents and Board of Directors Member, Arizona Educational and Informational Telecommunications Cooperative (AEITC)*
Introductions and Panel Moderator:	*Dr. William Lewis, Vice Provost, Information Technology, Arizona State University*
Theme:	*Telecommunications Efforts in Arizona*
Keynote Panelist:	*Ms. C. Diane Bishop, Superintendent of Public Instruction, Arizona Department of Education and Chair of the Board of Directors, Arizona Educational and Informational Telecommunications Cooperative (AEITC)*

The use of telecommunications by public education in Arizona is significant. Each level of education is represented at this symposium. I encourage you to spend time with those here representing their institutions. They will provide you with a in-depth appreciation of what currently exists, what is in process, and what is on the drawing board. My remarks reflect an overall view of education's telecommunications efforts in Arizona.

The first effort I would like to discuss with you is the Arizona Educational and Informational Telecommunications Cooperative, the sponsor of this symposium. I currently serve as Chair of the Board of Directors of this cooperative.

The Arizona Educational and Informational Telecommunications Cooperative (AEITC) is dedicated to encouraging and advancing cooperative planning and development of educational and informational telecommunications activities in Arizona. To achieve this purpose, AEITC:

- encourages the development of experimental and operational uses of telecommunications for educational and informational purposes;
- identifies the interrelated educational and informational communications needs of public and private educational institutions, related agencies, and organizations of all types that are concerned with the delivery of educational and informational services; and identify and evaluate the technical, operational and institutional arrangements for fulfilling those needs using telecommunications;
- provides a mechanism through which present and potential uses of telecommunications for delivery of educational and informational services can coordinate planning for such use of telecommunications services or facilities;
- informs the providers of educational and informational services, the public, private industry and governmental providers of such services, of (a) the uses of telecommunications as a delivery mechanism for educational and informational services; and (b) the technical, operational and institutional mechanisms through which such uses can be effectuated;
- participates in or conducts demonstrations of, or otherwise makes arrangements for, the use of telecommunications systems for delivery of educational and informational services.

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The organization was formed in the summer of 1988 by representatives from public universities, community colleges, the K-12 system and the Arizona Department of Administration. The chairmanship of the organization has rotated among the three sectors of education since that time. The Arizona Department of Education has served in that leadership role in 1990 and again in 1992 and 1993. In January 1994, the organization will hold its first election to determine the chair.

In FY 1990 the AEITC received an $80,000 appropriation (Senate Bill 1024) to conduct a telecommunications feasibility study in Arizona. The purpose of the study was to review various technologies that could be used to develop a statewide network and to determine how much a statewide network would cost. The study resulted in a *Report for a Statewide Network*, which recommended a statewide network using satellite and land-based delivery systems for an estimated cost of $12,750,00. This cost did not provide for end equipment such as codecs, video cameras, facsimile machines, television monitors, cable installations, and computers.

During this past year, the Cooperative has developed a set of by laws and a dues structure which opens its membership to all interested parties. In January 1994 we will elect a new Chair. There is a need in Arizona to have a dynamic membership organization which can serve as a forum for issues related to telecommunications. I invite you to join us and work with us to make Arizona a state noted for its cooperative approach to the development of its telecommunications infrastructure and services.

Now for a bird's-eye view of the numerous ongoing activities relating to telecommunications in education.

In July of 1989 the State Board of Education empowered the State Superintendent of Public Instruction to develop a plan for the use of technology in Arizona's K-12 education system. In July of 1990 the Board accepted and approved TIEDS, the master plan for the infusion of technology into the teaching and learning environment in Arizona's schools. The plan was developed by a group of individuals representing education at the K-12, community college and university levels, business and industry, school board members, technology and telecommunications providers. Since the development of the master plan, schools and the Department of Education have been engaged in its implementation process.

After pilot testing electronic connectivity with schools for three years, the Department of Education is embracing full implementation of the vision as defined in TIEDS. In cooperation with the Department of Administration and the Department of Library, Archives and Public Records, we are implementing Internet connectivity on behalf of K-12 schools and libraries statewide. The Department of Administration, State Procurement Office, is assisting us in securing a graphical user interface for access to the Internet. The Department has a Class B license which it will be distributing to school districts.

The Department of Administration, Information Services Division, is providing Internet connectivity via a T1 to Arizona State University. Participants in the Internet Connectivity Project are connected to the state telecommunications "backbone" in Phoenix and Tucson via 56kb Frame Relay provided by U S West Communications. Participants connect through the Frame Relay, through a dedicated lease line or through a SLIP modem pool for dial-in access.

The Department of Library, Archives and Public Records will designate which libraries in the state will receive Internet access through the Arizona Department of Education. As a partner in the project, the Department of Library, Archives and Public Records will receive Internet

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addresses, connectivity, technical assistance and training. It is anticipated that the Arizona Department of Education will conduct statewide training on the use of the Internet during the first week in November of 1993. This training will be conducted via satellite and will be broadcast from the Department's teleconference studio located at 1501 West Washington.

Examples of information and services that will be available to participants in the statewide connectivity project are: student demographics, school district profiles, and special program information such as Special Education, Vocational Education, Gifted Education, Environmental Education, Literacy, Chapter 1, Child Nutrition and Teacher Certification. The connectivity will provide for electronic mail, bulletin boards, conferencing and gateways to national and other state databases.

The teleconference studio serves as a model of the Community Access Learning Centers defined in TIEDS. It is a cooperative venture between the Department of Education and the Arizona Supreme Courts. The facility provides a variety of delivery systems for conducting multi-state conference calls, business meetings, employee trainings or special presentations. Specifically, the studio provides for:

- Audio Conferencing - point-to-point or multiple location telephone connections allow up to 10 sites to be connected, including out-of-state hook-ups.

- Compressed Video Interactive System - two-way interactive video system used to conduct standard business meetings between the studio in Phoenix and Tucson, Facsimile and high resolution computer-generated graphics are available for use with the system.

- Interactive, Full-Motion Microwave - multi-point, interactive video system provides two-way audio and video interaction between Phoenix and multiple classroom facilities at Northern Arizona University in Flagstaff, Yuma and Kingman. Tuba City, Keams Canyon and Kayenta will be added within FY 1994.

- Interactive, Full-Motion Satellite - one-way video, two-way audio satellite transmission allows thousands of people within Arizona and/or the continental United States to participate in trainings, meetings, staff development activities or any other appropriate activity that require timely information to be disseminated to very large audiences.

- Satellite Program Viewing - one-way video, two-way audio satellite broadcasts may be viewed and/or recorded for later viewing.

To accomplish its mission, the Arizona Department of Education must increasingly meet the demands of the accountability required by the public, the need for improvement in education, and the statistical basis for claims of improvement while facing declining budgets. The expansion of the utilization of technology will facilitate and allow the Department of Education to fulfill its mission in ensuring the best possible education for Arizona's public school students.

Because of the demands, the Arizona Department of Education has adopted a plan to transition from a centralized data processing environment to a distributed client-server computing environment. The purpose of this transition is to capture data at the trusted source to ensure data integrity and to present information in an efficient and timely manner. The plan of transition is to be used as a guide for technology deployment within the agency and as a blueprint for those requiring interoperability with the agency's information systems.

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The agency management has identified four strategic issues which require the expansion of the use of technology to facilitate their solution.

Strategic Issue I

The Arizona Department of Education will take a leadership role in the education reform processes necessary to improve student achievement.

Recommendations

A. Implement statewide education electronic mail systems to improve communication between the Arizona Department of Education and school district personnel.

B. Implement a database of education quality measures and outcome-based standards that are continually updated and accessible by schools, policy makers and the general public. Example: a secure school and teacher report care system that includes information on student achievement, course-taking patterns, dropout and graduation rates.

Strategic Issue II

The Arizona Department of Education will be the most accurate, reliable and unbiased source of information on education in and for Arizona. This implies that data will be accessible yet presented in the appropriate manner to communicate truth about education measures.

Recommendations

A. Develop an agency data repository architected on relational database technology and a comprehensive agency data dictionary which will allow for convenient but secure access to normalized (and non-duplicated) education data.

B. Select and easy-to-use graphical user interface-based query-by-example toll for front-end access into the agency data repository.

C. Charter an agency task force to design, formulate and review data sets and presentation formats to be accessible by specific domains, i.e., the public at large, school administrators and faculty, students and staff of other agencies.

D. Develop a mechanism to gather data at the source in order to capture the most reliable and trusted raw data.

E. Develop a system to improve customer service by allowing secure access to agency information. Example: school district check for teacher certification should be made available on-line.

Strategic Issue III

Increasing costs of doing business and increasing demands are stretching the resources of the agency to unreachable limits if we continue to utilize status-quo processes and technology. With the anticipated "no increase" or "decreasing" administrative budget expectations, we must find ways of doing things more effectively and streamlining the processes.

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Recommendations

Implement a "Business Process Analysis" study within the agency and determine the *workflows* associated with our agency tasks. Once the workflow is defined, eliminate tasks with little or no value added and use workflow automation tools where appropriate (including imaging). Example: signature-based paper flows can be converted to electronic authorization flows, especially in procurement, State Board and personnel requisitions.

Strategic Issue IV

The Arizona Department of Education will continue to monitor the compliance of schools, sponsors and qualifying programs with respect to fiscal contributions to those organizations. The Department also will continuously improve the methods for monitoring to include the provision of timely and cooperative compliance data.

Recommendations

A. Develop a system that allows for the timely discovery of district budgets that exceed limits in order to provide feedback when the option to correct is available.

B. Implement flexible accounting, apportionment and special programs information management systems that allow information retrieval, flexible queries, flexible formulae and robust decision-support tools.

b. Excerpts from Nancy Cummings' Comments

Keynote Panelist: *Ms. Nancy Cummings, President, Arizona State Library Association and Director, Yuma County Library District*

The galloping rate of technological advances is changing the way information is being stored and disseminated. This, in turn, is creating challenges of monumental proportions for the library profession. Librarians need to re-examine traditional library paradigms and approaches to serving communities.

I am convinced libraries need to:

- Take a leadership role in developing and nurturing information infrastructure in their respective communities.
- Form partnerships which link with their communities in new and expanded ways.

I am happy to say librarians throughout the state are engaged in these very activities. Technology afford us an unprecedented opportunity to accomplish these goals.

Economic Development Information Centers were established through a partnership with the Arizona State Library, ASPED, the Morrison Institute, and the statewide committee of EDLC. These 23 centers:

- Increase the information resources available to the business and economic sectors of the community

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- Enhance cooperative relationships among libraries and the private sector.

The EDIC centers are supplied with basic core collections. The beauty of the project is that all centers have computer capability to access on-line databases. Within the year, many participating libraries will be accessing the Internet.

Collaboration between public and private sectors could enhance financial and political support for development of a community's technological and informational infrastructure.

In Yuma, the Arizona Western College library and the county library are on line together. Patrons are able to access both catalogs via the on-line public access computers. Also, these have a dial-in capability.

Another community effort that the Yuma Library District is coordinating is the CIRL or community information resource link in automated data base of community information. Examples of partners in this effort are the libraries, the Chamber of Commerce, the United Way, the Yuma Economic Development Corporation, and the CCY. Again, there is a collaboration between private and public sectors that encourages the support for and development of technology and the information infrastructure.

I envision a time in the near future when I may be the director of a library without walls which is a neighborhood information center. Such a convenience store concept is practical and takes advantage of a no-frills approach in which a library will be equipped with computer, fax, modem, and a person to assist patrons.

As we prepare for the future, we are spending more of our budgets for access to information and less on ownership of information. Libraries will play key roles in developing our communities' information infrastructure.

Like President Bush's "points of light, the libraries are "points of service."

c. Excerpts from Videotaped Comments from The Honorable Jeff Bingaman, U. S. Senator, New Mexico

Hello I'm Senator Jeff Bingaman. As the chairman of two congressional sub committees on technology I'm deeply concerned about the many ways in which gains in technology affect our daily lives. No where else is the promise for technology brighter than improving education for our children.

The Technology for Education Act which I introduced earlier will help to bring modern technology into the classroom but the transformation of the classroom can not be possible without the development of a national information infrastucture.

The telecom one hundred can play a significant role in the development of a information infrastucture for the southwest and for the nation. And I look forward to hearing your results of this symposium your having. I like each of you to feel free to contact me with any suggestions you have.

Now I'd like to share with you my thoughts about the Technology for Education Act in the form of a video tape that I recorded earlier this year. I hope you find it informative. I wish you all good luck with the Arizona Telecommunications Issues and Policy Symposium.

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It's become almost a cliche or platitude to say that we're in the midst of a revolution in information technology but it is certainly true. We've seen changes in many aspects of our lives in the way we work, the way we interact, the way we shop. In all of these areas we seen changes as a result of advances in technology.

I had an occasion a few months ago in my home state to focus on this when I was at an invent sponsored by a scientific organization in Santa Fe called the Santa Fe Institute. The woman sitting beside me at the banquet had recently arrived in Santa Fe about a year previously and we struck up a conversation and I asked her how she was earning a living in Santa Fe since she had moved to Santa Fe from Vienna, Austria. She answered that she was earning a living in Santa Fe just as she had in Vienna. She was a translator. I said what do you translate. She said I translate German into English and English into German for corporate clients. My reaction was that I could understand how there would be a real need for those kind of services in Vienna but I wondered how much of a demand there was for that service in Santa Fe. Her response was that I found fascinating was that this had not been a problem because within two weeks after arriving in Santa Fe she had signed up for CompuServe and by using the e-mail facility of CompuServe she was able to continue servicing all of her previous clients in Vienna which they would e-mail to her the information to be translated she would do the translation and e-mail back the results and through this device she had been able to keep all the clients that she previously had and earn a very good living in Santa Fe as a translator from German to English and vice versa. That struck me as a dramatic example of the kinds of changes that technology has brought to the way that we work and the way we earn a living.

To contrast that with the use of technology and education in my own view is that education has lagged seriously behind almost every other area of our national life in using technology efficiently. In education just as in technology we are also on the verge of a major revolution. Americans have awaken to the need for dramatic improvements in education. The form of our education system is something which is on the national agenda. I recently introduced a bill which was co-sponsored by senators Kennedy, Harkins and Corchran to help address these issues of technology and its use in education. We hope that this bill entitled the Technology for Education Act of 1993 will help to energize this revolution in the way that we teach our children the way we prepare our children and ourselves for the jobs of the future. The Technology and Education Act will help to develop a comprehensive strategy to integrate educational technology into the curriculum of every American classroom. Use of technology in my view is the most cost effect way that the federal government can help states and local school districts to meet the challenge of our national education goals.

Very briefly let me describe the bill. It does a variety of things. It establishes an office of educational technology in the department of education, it establishes an assistant secretary of technology in that department and it provides federal funding to support state technology in education planning. This has not been near as extensive as I believe that it needs to be in most of our states. The legislation also provides funds for the acquisition of technology by poorer school districts that would create a national education information dissemination system that uses existing networks in trying to tie those networks together for use in our school. It would support the development of high quality curriculum based software and other supporting materials by consortia, private industry and business in partnership with education institutions. The legislation goes on to establish regional technical assistants in teacher training consortia throughout the country. The training of teachers to use technology is an essential part of getting that technology introduced throughout our school system and this legislation provides funds for that as well as for research on advanced technology that can be used in education. We are currently establishing national education goals and standards, content standards and

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performance standards which are natural arenas in which to use educational technology through common applications.

What little bit I know about computers has lead me to conclude that the first rule to beginning to use a computer is to focus on what is the intended application not on the technology itself. You need to decide what you're going to use that technology for and part of what has slowed down the wide spread use of technology in our schools is the lack of agreement on what applications should be pursued. We will soon have agreement on what we want our students to know in basic course subject at each grade level and once those standards are set those content standards then the ingenuity of the private sector can be put to the job of producing the tools that assist in teaching that material in the most cost efficient way Technology can revolutionize the way that we teach our children. It can change the way that they learn just as profoundly as it as altered other areas of the American work place.

Let me mention one example of how technology can create regional classrooms and expand educational opportunities for our children. Each year in my state I conduct student seminars for high school students where we bring three or four high school students from each high school in the state together to talk about issues pending on the congress and major issues confronting the country. This year at the lunch during that day long seminar I was seated with three students from one of our smallest high schools Camalo High School in the western part of New Mexico where they have a graduating class this year of five and also seated with two students form our largest high school West Mesa High School in Albuquerque where they have a student body of between twenty-four and twenty-five hundred students. I asked the students of both groups what they could do in the way of foreign language training foreign language instruction in their schools. The students from West Mesa High School were quick to respond that they had the opportunity to study Spanish and French and German, and that they had a career enrichment center that they could go to and study Russian and Chinese and Japanese and variety of other less known languages in this country at least. I then asked the students from Camalo High School what foreign language instruction they had available. Then they replied they had none that they had never had a student qualify to teach any foreign language and therefore they had never had instruction of foreign language.

Technology makes it relatively simple for us to solve that problem today. There's no reason why rural high schools such as Camalo High School in New Mexico and throughout this country should not be equipped with distance learning capabilities and those course offerings be made available to students in those schools. Advanced information technology is obviously not the cure-all for American's educational problems any more than chalk on the black board where the cure-all for educational problems when they were in them. But technology can do a great deal to make educational opportunity real for all of our students. It can do a great deal to raise the level of performance of our schools and of our students. The classrooms of the future we are designing across the nation those which utilize educational technologies must be grounded with the goal of equity and access for all of our students. The Technology for Education Act of 93 which we've introduced can provide the vision and strategy and resources help make that goal a reality. I wish you all in your conference. Thank You.

As I said before I'm very interested in the result of this symposium and in your thoughts about the Technology for Education Act. Please write to me at this address:

Senator Jeff Bingaman
110 Hart Building
Washington, D.C. 20510

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d. Excerpts from Marshall Allen's Speech

Welcome:	*Mr. Paul Kessel, Associate Dean, Instructional Services, Mohave Community College and Operating Committee Member, Arizona Educational and Informational Telecommunications Cooperative (AEITC)*
Introductions:	*Dr. Arthur Ashton, Special Assistant for Strategic Planning, Arizona Board of Regents and Operating Committee Member, Arizona Educatoinal and Informational Telecommunications Cooperative (AEITC)*
Theme:	*Perspectives on Telecommunications Integration and the Roles of Education, Business and Industry, Government, and Military in the 21st Century*
Keynote Speaker:	*Mr. Marshall E. Allen, Director, The Institute for Telecommunications, Oklahoma State University*

I don't really quite know how to approach this event this evening. I've known Janelle a long time, and I was pleased to respond to her phone call. All of you, I'm sure at one time or another have been in the position of having to select a guest speaker, a keynoter. You usually start out with that nationally renowned expert who has all the answers, all the solutions, a George Gelder type, high dollar, inspirational speaker that demands attention, also demands a high fee. At the other end, you have a friend, doesn't have a hell of a lot to say, but he's free. Janelle assured me that I'm somewhere on that list.

As the head of the Institute for Telecommunications at OSU, I have opportunities to work with business, industry and state government. I had an opportunity recently to work with a major metropolitan chamber of commerce talking about telecommunications (Tulsa, Oklahoma).

Tulsa believes that it has a couple of major problems. Tulsa is being targeted by a lot of major corporations as a potential site to relocate a company. The first question, without fail, that most major companies ask when they go into a community and talk about relocation is, "How can you help me in terms of my telecommunications needs?" Tulsa's concerns are: (1) How can Tulsa respond? How can it support that company and their telecommunication needs? (2) How can Tulsa supply a trained telecommunications worker to go into that new business and industry? A major company in Tulsa has a 2 member "emerging technology department." As the manager said, "we simply cannot keep current. There is no way these two people can keep current on telecommunications technology."

What makes my life so exciting, what makes things enjoyable and challenging, is that we're really in an era of rapid change. We've got new technologies, new applications and new user requirements. (See Attachment A.)

When I read the letter from Janelle, asking me to participate, I was struck by a sentence that said, "We will gather to find key telecommunications issues, policies, programs, and legislation which will enable Arizona to take a leadership role in the information age of the 21st century." I want to tell you, in all honesty, Oklahoma went through a similar process. We tried to assess our capabilities. We looked at what present infrastructure we had in place. We put together a very aggressive plan. We put together a plan which was sponsored by the Governor's office. Please understand that obtaining the Governor's support was a long haul.

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It's taken us over a year to get the Governor to understand that you should not worry about technology. You should worry about the application. Don't worry about how we get it there. The device, the transportation, the mechanism should be transparent. Let's worry about the application and the content. (See Attachment B.)

Let me summarize points the Governor listed as he was building his telecommunications platform. Because of our central location and productive work force, many companies have selected the state for telecommunications (back office facilities). Hertz has a big data processing center. Avis. The American Airlines "Sabre System." Twenty-seven Oklahoma communities have targeted telecommunications-related industry for economic development purposes. Stillwater is one of those twenty-seven. As a result, we've had three small companies relocate to Stillwater, Oklahoma. Learnsat manufactures, distributes and installs antennas of various sizes. A multi-million dollar company. Parker Consulting relocated from Wisconsin and established the Teletraining Institute. There's a sound box, a voice kicker, a sound component available for your computer. Those elements are made by Creative Labs, and their Technical Services Division has relocated to Stillwater.

The flagship plant of AT&T is in Oklahoma. The nation's 4th largest fiber optic network, WilTel, is in Oklahoma. I think you see Oklahoma has a lot to be proud of. I take great pride in the fact that the Governor had a sixteen page State of the State Address, last February. Four pages were dedicated to telecommunications.

In terms of setting an agenda, the Governor said, "Telecommunications is the best example of how a small state can play with the giants. If we take advantage of the opportunity to be first, Oklahoma's going to be a winner.

"The current commodity-based Oklahoma economy is not powerful enough to propel itself, propel the state to a more prosperous future. In the future good paying jobs will be information intensive. Many of these will be in the services sector, as well as in manufacturing. Distance and location become increasingly irrelevant as technology supersedes business. Commodities regions in states which get organized first, invest in living and working in the information age, will win the race to new jobs. Many information based businesses that are already thriving in Oklahoma offer powerful proof that we can be successful. This is more than just fiber optics in the ground. It involves developing applications and creating demands through innovations. It involves public and private partnerships, etc."

As a result of the Governor's initiative and a lot of state wide activities, the legislature put together the initial funding for a group called "Oklahoma Futures." Oklahoma Futures is a think tank. Oklahoma Futures has appointed several focused task forces. The one for telecommunications was co-chaired by the President of Oklahoma State University and an economist for Southwestern Bell. A state-funded think tank bringing together citizens focused their efforts on 5 critical actions: (1) we should create Oklahoma Telecommunications Authority as a public/private partnership to coordinate development of Oklahoma telecommunications systems; (2) we should review Oklahoma's regulatory policies and practices regularly and formally to attribute and support development strategies; (3) we should develop a state wide telecommunications literacy and awareness campaign designed to generate demand for services and increase utilization; (4) we should create, attract, finance, and/or implement our telecommunications projects using leading edge technology; and, (5) we should reconceptualize rural based, aged community centers which include collective specialized equipment where citizens do not have to have private access and can use modern accessible telecommunications technology.

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Part of the Governor's priorities deal with a review of the regulatory environment. No real intent to deregulate the utilities, but maybe reregulate, but certainly to look at the whole regulatory environment. That's probably one of the most critical issues. As a result . the state formed a Data Processing and Telecommunications Advisory Committee. The committee has $14 million set aside from a bond issue. They are going into a complex process of trying to decide how this $14 million is going to be spent on telecommunications projects. How much is going to higher education? How much is going to telemedicine? How much is going to be spent to expand the present infrastructure?

Oklahoma has a lot of things in common with Arizona. I was so pleased to see some of the words, the paragraphs, sentences that came out in some of the literature I read today about Arizona because we both obviously have rural-based states. You have three and a half million population. We have three million. We have more square miles than you do, I'm sure. You have less state funded or higher education campuses to fund than we do. You have 3 university campuses. We have 27 campuses we have to fund. We've gone through a 3.5% reduction in the budget.

We have finally been able to get the legislature to understand we're looking at a blended technology. We're looking at a hybrid. This is not a fiber versus satellite issue. It's a little bit of everything. (See Attachment C.) If you look at all the magazines, and you read half of what I read, it's a fairly wide belief that this nation is going to be wired with fiber eventually. They aren't going to finish until the year 2034 at least. The earliest I've seen has been 2015. The latest 2040. So if you're going to make an intensive effort to wire this nation with fiber you're well into the year 2030. It's going to cost something in the neighborhood of $140 billion. What are we going to do in the meantime? What am I going to do to serve my students? What is Ed Groenhout at NAU going to do? What are we going to do to serve the public? The adult at home. The student that is sitting in Cactus Shadow, AZ. He or she is not going to wait for fiber. Their grandkids are not going to wait until the year 2034. I think the point is, there needs to be some action today. There needs to be a rational solution. And folks, there's a wide variety of ample technology.

Try to understand that Oklahoma is truly a rural-based state. If you draw a line from the northeast to southwest corners of the state, thirty miles wide, seventy percent of the state's population is in that belt. Oklahoma State University is an area that contains 10% of the state's population. However, I have a statewide commitment. How can I reach 90% of the states population? Telecommunications!

Let me switch forces a little bit and talk about another technology. I was at Oklahoma State when we were approached in about 1989, by a Lt. Colonel from the Army called Jim Cary. Jim was in the process of putting together a significant proposal, a totally satellite-based, compressed video, interactive teletraining system for the military. Jim was interested in knowing whether OSU, with its established reputation to education and technology had any interest in participating. That was my first introduction to Janelle. At that point, she was working with Jim, as a consultant to the Office of the Chief of Staff of the Army. I give a lot of credit to Janelle and Jim Cary both for having put together a very aggressive and innovative plan. The good news is we won the award. TNET is a one-of-a-kind and incredibly unique system. It's satellite based. It's compressed. It doesn't depend on land lines for any audio. By the end of this year we should have 80 sites. We have sites in Hawaii.

We just came back from Virginia. There is a new Colonel in charge of the TNET program. A Colonel Pat Blazer. Pat has an incredibly good attitude; he's totally sold on technology. He

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understands the benefits. Pat said, "Do you understand now why I'm so excited? Do you understand what interest Iowa holds for me? Do you understand that through the technology which we can manage from Monterey, California, or Hawaii, Florida or Virginia, we can now take live, interactive training to enlisted personnel who is sitting in Davenport, Iowa on a sofa watching TV. On a Friday evening that military individual does not have to leave his family and does not have to spend three days at some other place in the out-back of Iowa. We have the ability to take training, information, and education to where he lives and breaths and works." The military understands how a satellite system in Virginia can tie to an Iowa fiber. That's what, to me, makes life exciting.

Pat also referred to, "So now you know why, what I think I can do with CLIN." I don't know how many of you know about CLIN. This is the Community Learning and Information Network. Another opportunity that Janelle and I had to work together was during her work at the U.S. Chamber of Commerce in design phases of CLIN. But first let me finish my comments about TNET.

The best and most successful application of the technology has come from the Presidio, military intelligence, CIA, armor, and artillery units. (See Attachment D.) The thing that's so exciting about technologies is being able to direct it, form it, move it, to get it generated up because of some world crisis. I'm told today that some of the training going on in TNET currently is related to gearing up languages for what they anticipate to be hot spots or potentially troublesome spots around the world. People are being trained now in the language and culture of that particular country all via TNET. (See Attachment E.) This is the thing that's so exciting about technology. It can be moved and realigned. There have been a variety of tests trying to compare one-way to two-way to traditional. The failure rate was higher in those that had the traditional versus the two-way or the one-way. I'm not sure I can tell you why. I don't know why the failure rate was less for two-way. I don't know why retention was higher with two-way. However, the results are fairly consistent. (See Attachment F.)

Here again are some of the TNET achievements: (See Attachment G.) First ever to link with Hawaii. So, we have a live two-way interactive point between the continent and Hawaii. Racked up 47,000 hours of languages specific in Arabic because of Desert Storm and Desert Shield. We have the ability and technology to respond very quickly with relatively no inconvenience or expense.

CLIN is a TNET technology. CLIN has been a concept that involved a satellite based compressed interactive video which was to be given to each and every community. Ask Janelle. She is far more knowledgeable than I. But in my perspective, CLIN was a TNET based technology that was being promoted by the U.S. Chamber of Commerce, using the local chamber as a point to coordinate that technology for the community. It was an opportunity for that community to have access to the system. So, you're really giving that community a window on the world through technology.

I need to indicate why some of this is important, why it's frustrating, why it's challenging, and why it's rewarding. Day by day by day, we're looking at changes. We're looking at changes in format. Emphasis is on multimedia. You've got changes in processing, displays, storage, integrated systems and simulation. Virtual reality is a two-word catch phrase that has everyone so intrigued. Some of the issues that we worry about are changing day by day by day. We're looking at hybrids. You can look at video, audio, and images. They go with satellite. They can go with twisted pair. In many cases, satellite goes to fiber then it goes to a computer. So, we're not looking at a single technology. We're looking at multiple technologies which are all blurred as well as blended.

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Last but not least, why does all this matter? I started off discussing economic development. Let's go back full circle. Let's look simply at the growth. (See Attachment H.) Look at the growth in teleconferencing. Let's use the word telecommunications as an all-encompassing term. We look at the fact that we had $820 million being spent in 1989. Now in 1992 it's $2.050 billion. There is a significant growth. And that table, from what I can tell, is not about to flatten out. Those figures appear to have some linear growth. I guess it really does matter. The value, having some kind of commitment to telecommunications, at least from an economic development point of view, has been obvious for Oklahoma. We're not a rich state - rich in resources - rich in people. Telecommunications, as the Governor put it, is the only way that a small state like Oklahoma can play with the giant states. You need to make a commitment to telecommunications. Thank You.

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Attachment A

(Keynote Speaker: Mr. Marshall E. Allen, Director, The Institute for Telecommunications, Oklahoma State University)

TECHNOLOGICAL CHANGES IN THE WORLD AT-LARGE

SIGNAL FORMAT
MULTIMEDIA FOCUS
PROCESSING
DISPLAYS
STORAGE
INTEGRATED SYSTEMS
SIMULATION
NETWORKS
COSTS AND USEFUL LIFE

Attachment B

(Keynote Speaker: Mr. Marshall E. Allen, Director, The Institute for Telecommunications, Oklahoma State University)

DISTANCE EDUCATION TECHNOLOGY

There is always a question about technology.

- Audio, video tapes
- Broadcast TV
- Computers
- Teleconferencing System

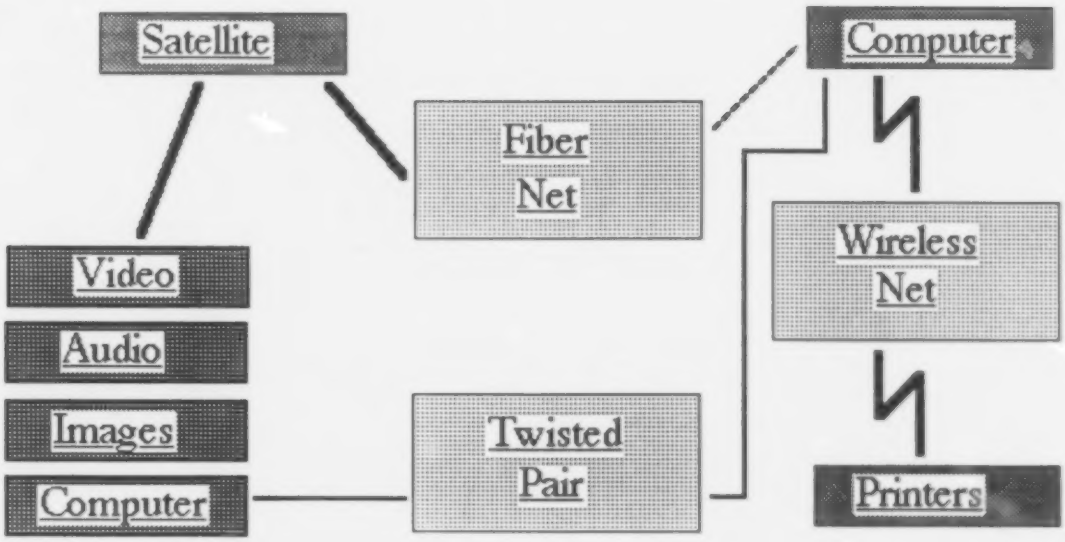
The technology will always change.

Focus not on technology but on content.

Attachment C

Keynote Speaker: Mr. Marshall E. Allen, Director
The Institute for Telecommunications
Oklahoma State University

Hybrid Combinations



Attachment D

(Keynote Speaker: Mr. Marshall E. Allen, Director, The Institute for Telecommunications, Oklahoma State University)

U.S. ARMY TNET USERS

DLIFLC Network (Defense Language Institute Foreign Language Center at the Presidio of Monterey, CA)

Military Intelligence Units

CIA

Armor Training Center

Artillery Training Center

U.S. Special Forces Training Center

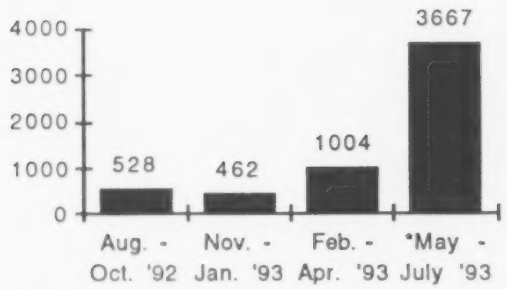
Community Colleges

ANG Military Academies

Attachment E

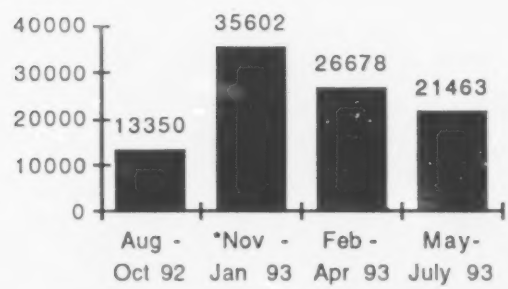
(Keynote Speaker: Mr. Marshall E. Allen, Director, The Institute for Telecommunications, Oklahoma State University)

TOTAL NUMBER OF TNET STUDENTS



* Greatest growth and widest variety of courses offered (increase includes ANG annual training periods)

TOTAL TNET STUDENT HOURS



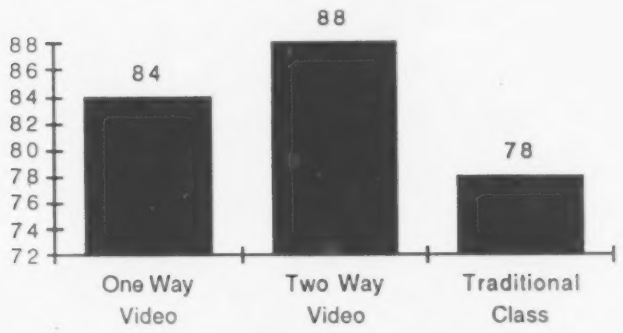
* Increased DLI Training for Department of Defense: Bosnia, Sarajevo, Arabic languages, etc...

Attachment F

(Keynote Speaker: Mr. Marshall E. Allen, Director, The Institute for Telecommunications, Oklahoma State University)

ARMY TNET TEST RESULTS

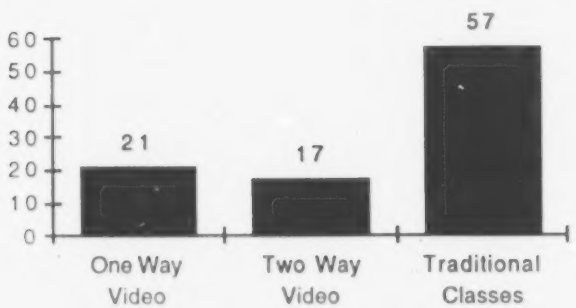
* Average Scores/Retention Higher



* Kentucky ANG 6-month Analysis

ARMY TNET TEST RESULTS

*Failure/Retests Rates Lower



*Kentucky ANG 6 month Analysis

Attachment G

(Keynote Speaker: Mr. Marshall E. Allen, Director, The Institute for Telecommunications, Oklahoma State University)

TNET ACHIEVEMENTS

Operation Desert Storm/Shield: 27,000 students hours teaching Arabic

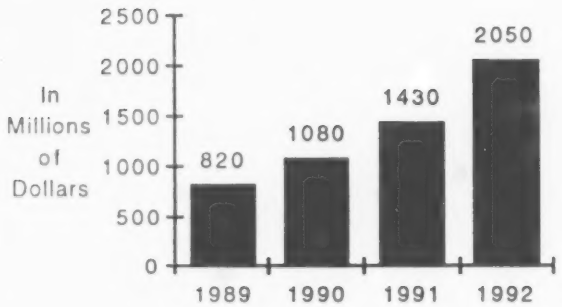
April 1993: First time ever to link Hawaii with 2-way, point-to-point TNET language classes. Highly successful

TNET continues to support drug enforcement activities and Department of Defense special missions of an international scope and level.

Attachment H

(Keynote Speaker: Mr. Marshall E. Allen, Director, The Institute for Telecommunications, Oklahoma State University)

TELECONFERENCING ANNUAL GROWTH 1989-1992



3. Highlights from Friday, October 1, 1993

a. Excerpts from Elliott J. Hibbs' Comments

Welcome: *Dr. William R. Noyes, Associate Vice President of Academic Affairs, The University of Arizona and Operating Committee Member, Arizona Educational and Informational Telecommunications Cooperative (AEITC)*

Introductions and Panel Moderator: *Mr. Hank Stabler, Director of Information Management and Technology, Peoria Unified School District No. 11 and Operating Committee Member, Arizona Educational and Informational Telecommunications Cooperative (AEITC)*

Keynote Speaker: *Mr. Elliott J. Hibbs, Director, Arizona Department of Administration and Board of Directors Member, Arizona Educational and Informational Telecommunications Cooperative (AEITC)*

Good Morning and thank you for the opportunity to speak to you this morning.

The Governor sends his regrets, but he is unable to attend this morning due to an illness in the family, causing several major changes in his schedule.

It is mind-boggling that I am doing this talk this morning. Eighteen months ago I expected new technologies to arrive and make my life easier. I didn't much care how, it was hard enough to learn how to take advantage of it. Thank God I had children so they could teach me how to use the VCR.

We have come to realize the great importance we must place on properly developing technology and how important people like you are.

Marshall McLuhan said that the new electronic independence recreates the world in the image of a global village. We need to be prepared to be in the heart of that village.

Those of us who have responsibility in the area of technology development must be aware of the need to do it right and with the lowest cost. Doing more with less has become more than just a fad, it is necessary for everyone in government to provide the services that our customers require within the funds available.

This is even being demonstrated by the reinventing government initiative introduced by Vice President Gore to make the Federal Government more efficient.

Information technology is at the top of the list of restructuring tools. Services should include wide deployment of networks, on-line data bases, and citizen accessible applications. The electronic government provides the link between government agencies and to the public.

The Governor has also set some major goals for state government that require significant improvements in government including its management and use of technology.

He has introduced Total Quality Management to State government to improve services while reducing the cost. This has resulted in $166 million identified in one time and ongoing reductions plus cost avoidance. It has paid big dividends in the Highway division by reducing

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their cost by $35 million and 729 positions while reducing the time to get a drivers license from 28 days to 5 days.

He continues to balance our state's budget while lowering the tax burden.

And he continues to attract business to our state and encourage existing business to expand. In 1991, 98 new companies moved to Arizona and established 19,000 new jobs and brought in $560 million to the economy. Unemployment is at a low of 5.5 percent. Job gains predicted in every industry through 1994. Twice as many jobs gained first half 1993 as first half of 1992.

Information technology can be the most important tool for re-engineering functions in Arizona governments in the coming years, making Arizona an even more attractive state for business expansion and relocation.

It can also become a barrier instead of an aid if not treated correctly. We cannot create separate islands of information that can not be shared, in some cases this has already happened, in part, perhaps due to lack of equipment compatibility, but in most cases, it is lack of cooperative planning.

We cannot afford to duplicate the same applications over and over rather than using the resources that are already paid for more effectively.

We cannot create multiple communications networks, sometimes for single applications, without evaluating what can be shared.

The bottom line is that the cost of technology can be much higher than it should be and that technology is not very effectively used if we don't produce systems properly. In an era where demands will continue to outstrip available government revenues, effective and efficient development of technologies is not only desirable, it is imperative for continued economic health.

There is plenty of light to help us work through the potential pitfalls.

I sense a strong commitment to an information highway, including voice, video, and data capability, throughout Arizona which will enhance educational effectiveness, support economic security and development and provide equal public information access.

If done right we know a state-of-the-art telecommunications system will allow information access to Arizona's citizens regardless of their geographic location.

We know:

- Such a system can promote greater equity between rural and urban areas for access to education and economic opportunity.
- Such a system will provide access to time and place-bound citizens that would find it otherwise difficult to tap into necessary services.
- Modern telecommunication can take education to the student rather than requiring the student to travel to education.

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- A state-of-the-art telecommunications system can help Arizona become the trade corridor for free trade among Mexico, Canada, and the U.S.

- It can position us to capitalize on the global economic opportunities presented by information access.

To achieve our goal, Arizona needs to build upon the existing telecommunication infrastructure which includes NAUNet, The Arizona Department of Education network, ASPIN, the Department of Administration network and others.

Government gives support for unification of all telecommunications efforts in the State, including AZTEL 2000, AEITC, GSPED, and others, and encourages and supports greater coordination and cooperation among these and other organizations promoting telecommunications interests to develop and implement the statewide plan to give us clear direction.

This cannot delay, Arizona's information highway is vital not only to meet our state needs, but to support the National Information infrastructure initiatives.

This system will no be without cost. To help, Arizona needs to be positioned to take advantage of any national telecommunications funding opportunities and create private/public partnerships to produce the telecommunications system we all need and can benefit from.

Symposium such as this will help to create an environment where all ideas can be shared to create possible solutions to the overall problem of how to effectively and efficiently share information and help us move forward. I salute you on your efforts in this symposium and urge your continued cooperation and concentration to create the telecommunications system we need for a sound future.

b. Excerpts from Videotaped Comments from Senator Dennis DeConcini and Senator John McCain

Welcome: *Dr. Elizabeth Craft, Director, Distance Learning Technology, Arizona State University and Operating Committee Member, Arizona Educational and Informational Telecommunications Cooperative (AEITC)*

Introductions: *Mr. Edward Groenhout, Assistant Vice President, Educational Systems Development, Northern Arizona University and Operating Committee Member, Arizona Educational and Informational Telecommunications Cooperative (AEITC)*

Keynote Speaker: The Honorable Dennis DeConcini, U. S. Senator

Hello, I regret that my schedule will not allow me to attend The Arizona Telecommunications Issues and Policy Symposium in beautiful Chandler today, but I do appreciate the opportunity to say a few words on a revolution that is changing our lives and will continue to alter how we, as Americans, live. The goal of the telecommunication revolution is not to find a need for our new technology but to find the means available to utilize the current and evolving technologies to fit the current needs. This is our challenge.

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The Arizona Educational and Informational Telecommunications Cooperative is taking the lead in our country by holding this symposium this week and by their dedication to coordinating statewide telecommunications networks. As this technology grows, we will need to have a central coordinating entity to keep Arizona on top of this revolution of information. Our future economic growth and strength will depend on a good network.

I recall visiting electronic classrooms at NAU in the early stages of electronic delivery of courses to Yuma. I actually participated in an interactive session with students at Flagstaff and Yuma simultaneously. Seeing NAU's network expand to include 10 sites, 3 of which are on the Navajo and Hopi reservations, is especially pleasing to me. In conjunction with other universities and rural community colleges, it is clear that greater opportunities are available to rural areas of Arizona through NAU's educational and informational network.

On another front I recently added NAU's elementary, school foreign language program to a short list of projects being considered as part of Vice President Gore's national information infrastructure initiative. Though still in conference committee, I have every hope that NAU's effort to form a national foreign language network will be recognized and successful. These programs are just the beginning for Arizona.

Every day the industry of telecommunications changes. It is up to people like you to implement this technology . From this symposium you are working on a white paper, I understand, to document twelve to twenty directives from you, the participants. I look forward to seeing this document and learning of the direction you recommend Arizona to go in the next ten years.

Do not take lightly this task, and I challenge you to look forward as we create history. Again, thank you for this opportunity, and I look forward to learning of your findings.

Keynote Speaker: The Honorable John McCain, U. S. Senator

Thank you for allowing me to address this very important symposium. It is innovative Arizonans such as yourselves that well keep Arizona leading the nation as we construct the information highway.

When we discuss the electronic highway and the competitiveness of U.S. companies in this emerging field, I believe we must be open to new ideas and new ways of thinking. Together the government and the private sector will be in working new, uncharted areas of communications and information transfer.

In 1862 the Congress agreed to a plan for the construction and operation of the transcontinental railroad that would link our country's two coasts. Seven years later on May 10, 1869, due to a partnership of the Congress and industry, North America became the first continent in the world to be connected by rail from coast to coast. That historic milestone pales in light of the electronic highway that will soon connect not only every household in America but will undoubtedly be worldwide. As with the railroad, the U.S. stands to be the world leader in this area. The Congress and the individuals on this panel and in this room must now forge a unique partnership that will allow U.S. technology, industry, and inventiveness to prosper.

I would like to focus not on the specifics of the electronic information highway, but on the partnership I just mentioned. The government currently spends $76 billion annually for

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research and development. Today approximately 60% of federal R & D money is devoted to defense programs. The remaining 40% goes to non-defense efforts. With the break-up of the Soviet Union and the end of the Cold War and a change in our strategic missions, we now have the opportunity to focus more on civilian uses of these funds. In conjunction with this dramatic shift to more civilian cutting edge technology will be the creation of new global industries and the revitalization of existing ones. We must encourage this healthy mix of new and old companies working together and using their combined resources and ingenuity as we move forward in this area.

We must also recognize that as we venture into these new areas we will be testing the legal and technical barriers that currently exist. The Congress will play a unique role in shaping what form these new boundaries and barriers will take.

It is important that the Congress not create barriers that will impede the growth of these new industries. Current anti-NAFTA (North American Free Trade Agreement) rhetoric is dramatic proof that protectionist policies still have much support in the Congress and in America.

Telecommunications is now a global industry. A few months ago the Washington Post reported in an article entitled *Remaking the World of Telecommunications* that partnerships of MCI and others will offer opportunities for seamless global networks. It is these kinds of ventures that I believe will be the rule and not exception in the future.

The Congress must resist anti-free trade legislation that may jeopardize these alliances. The Congress must also understand that you here, private industry, are the key to the creation of the electronic superhighway, The unique partnership I have mentioned must carefully address the specific role of government in this area.

Of particular concern to many others and myself is that although government must encourage high risk, long term venture capital investments and start-ups, we must allow industry the maximum latitude to operate on its own. It is crucial that any plan rely first and foremost on the private sector and not on government-sponsored industries or partnerships.

Where the government can and, I believe, must have a constructive role is ensuring that the electronic highway neither ignores rural areas of America nor becomes a play toy to the exclusively rich and well off. There has been considerable talk of creating a digital superhighway that would link universities, businesses and homes into one super-information network. This highway would join the nation's burgeoning population of computers. While the government should allow and encourage this digital highway to be developed with the least amount of interference, the government does have an obligation to ensure that the residents of places such as Tombstone, Arizona, and the Grand Canyon are not left out.

Additionally, we must monitor these developments closely to ensure that those at the bottom of the economic spectrum; people such as inner-city youth and Native Americans, are not in any way not allowed access to this superhighway.

The government will also play a crucial role in the area of technology transfer. For decades the government has collected troves of information. The Clinton Administration, like the Bush Administration before it, is now strongly pushing for much of this information to be declassified and made available to U.S. industry.

In summary, as I have stated, however, we must keep government involvement in the electronic highway at a minimum. The government should guide, direct, and ensure that all are

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allowed to participate equally in any emerging technologies. The Congress should not micro-manage, become entrenched monetary and business partners, or seek to control innovation.

Business, not the Congress, continues to expand the boundaries of telecommunication. Who in Congress could have foreseen twenty years ago the growth of items which are now commonplace, like the fax for example? Industry deserves the credit for these innovations. We should applaud their efforts and allow the free market, not congressional mandates, to determine what technologies will be most useful to the American people.

We must forge a new, unique partnership that encourages the growth of small companies and doesn't allow them to simply be absorbed into large conglomerates. We must work for policy that will at the same time allow largest companies to use their immense capital to develop new cutting edge technology. We must also accept that the electronic highway is not unique to the United States. We must encourage global sharing of ideas and information . This kind of free trade is crucial to ensuring long-term U.S. competitiveness. I believe that if the experts of industry and the government work in this fashion there are no limits to the benefits the electronic highway will deliver to America as a country and to Americans everywhere.

Thank you all for your attention and have a wonderful day in Arizona.

d. Excerpts from the Final Policy Recommendations Plenary Session

*(Please refer to Appendix A, The 16 Directives of the Telecom*100)*

Session Moderator: Mr. Edward Groenhout

Education Strand Report

Reporter: Darel Eschbach, Arizona State University

The idea is that we need to get everybody involved in the implementation. When it comes to identifying the customer needs and identifying the associate training, it is a very complicated and very inclusive sort of activity. There was concern that the timeline was yesterday, meaning as soon as possible. The evaluation should be continuous. An education subgroup emphasized one the Senator's ideas that we have to deal with fairness and parity. The term "world reservant" was used in some of the discussions. Comparable opportunities should exist across the state for access to information, learning, and all that the network can provide regardless of the geography, cultural setting, economics, or other considerations such as disability. Again, thinking in the context of fairness associated with something like the A.D.A. (Arizona Department of Administration).

Solutions: We need to establish a needs analysis which is very user, customer oriented. A needs analysis should identify basic applications packages and systems that would be available to all Arizona residents. And once more, we felt that AEITC would be the sort of organization that might be very key in terms of making these things happen.

Supporting mechanisms: Standards issues and having input from other organizations is important. Once again, the timeline was as soon as possible, yesterday. The issue is that a

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number of people were very concerned that we have citizens and particularly the children in this state losing out because we don't have resource facilities in place.

Evaluation is a little more difficult to talk about. Identifying immediate funding sources that AEITC that may be able to help with followed with the surveys and so forth to do a longer term real evaluation.

The fourth issue that this group thought was extremely important, and ,therefore, got on our short list was the whole consideration of costing and funding. In this context, it was determined that a need to develop a strategic plan is absolutely crucial so that you have something to talk about in terms of trying to acquire funding. And within AEITC, potentially a 501 C3 might be setup to help solicit dollars from foundations and other sources, federal government, etc. to support the execution of this strategic plan. The idea is that with so many of the education activities in the state, the state is not able to step up to the complete cost. We really need to look for other sources of funding.

Implementation: Since we identified AEITC as sort of a subset taking a lead in that, and the timeline for this particular activity, primarily the strategic planning document, would be to have it available for the 1994 AEITC Annual Conference.

Business and Industry Strand Report

Reporter: Brian Paige, Tucson Medical Center

Before I get started, I'd like to thank a couple of people, Janelle for at least inviting me. But probably more importantly, Ron Trasente, Paul Kessel, and Todd Lutz. Ron and Paul, the two facilitators, from my perspective, were truly outstanding facilitators. They kept us from wandering off on tracks we shouldn't have been on and made our job considerably simpler. And Todd, because he did an excellent job recording the thoughts of the group.

Business and industry need to know the issues related to education and government and the other areas.

Regulatory issues need to be addressed. The question is whether we're talking about deregulation or more regulation. Arizona needs reregulation that will allow us to have open competition to get this done. Closed networks and an open environment are what will make it more acceptable to everybody that's here. Closed environments won't work. What we're doing is what the information systems people did for years. We're going to find a solution, and sooner or later, we're going to find the problem that that solution fits. We really have to go out and find what it is that needs to go across this network.

What are the applications? I think that's strategically what AEITC needs to be focusing on. The network already exists. We're not talking about technology problems. We're talking about, what do you use the technology for? Let us analyze what the requirements of this network really are. It has to be a collective analysis. It can't just be education. The Senator was right on, we've got to form these partnerships. We've got to start learning and trusting one another. The syndrome that information systems people also created, 'it's not created here, it can't be any good.' Not true. Awful lot of intelligent people out there creating some very intelligent things that we ought to take advantage of.

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When we talked about the regulatory system, we're talking about modernizing it. We start taking a look at the regulatory system in Arizona. We're talking about things that address problems back in the early 1900's. Are those the issues that we need the regulatory system to address or is it something new today? Let's encourage and endorse open competition to invest in things like technology. If it's only the people in this room this, this is absolutely great. But in order to make this pliable, every small business needs to be part of it. Small businesses have as much to give as education does. Has as much to receive.

The second issue that we looked at was 'What are the requirements for it?.' Arizona has a statewide requirement for a commercial (industrial) strength network, regardless what the application is. The network should be ready to accept it, even if someone has a new idea. Networks connected to a city-wide network that connects to a state-wide network is the answer. It shouldn't matter where we have to go. As business leaders, we're going to have to have some formal policy group that decides on the policies that need to govern how this highway works. The reporting structure of such a group has to be formed from the members of the stakeholders and has to report back to the stakeholders. If each one the Telecom*100 is a stakeholder, each needs to know what the policies are and adopt them. This group is going to have to go back to each of the stakeholders and get consensus for what's being decided. Inventory and collective requirements are extremely important.

Standard setting: The longer we take to set the standards, the more difficult this task is going to get. Ask the computer industry. It's taken a long time to come up with standards. It's time, we've got to address that right up front. We must develop strategic alliances. The decision makers are sitting in this room. It gets back to this trusting one another to get the job done. We must create the environment for a statewide, commercial, multimedia telecommunications network. Volume drives down cost. Let's create an environment where everyone can play.

Legal security issues need to be addressed. They have to deal with privacy, standards, liability, accessibility, confidentiality. An example of why this is important is the electronic signature. In the medical field, the state laws say that a physician must sign all patient orders in ink. Laser printers don't use ink, per se. How can electronic signatures be made valid, unless the laws change?

Data Integrity. If a decision is based on someone else's data, and it's bad data, who is liable to be sued? That's a liability issue.

Data originality. What is an original document? As an example, in the medical field, a report on an X-Ray. At some hospitals that is done electronically, digitally. A document is created that goes into the medical record and is then sent as an electronic version to a radiology firm which keeps it electronically. What happens six months later if there was a wrong diagnosis? What if a radiologist sees that he made a mistake, and he's got an electronic version of that document that he dictated? What if the document is altered electronically? The hospital has a report from the medical record. Which one is the original document and how will the courts know?

We need to have a marketing strategy to inform and educate potential users. Public forums and directories of services are available. Those directories could be in libraries across the country. Small business associations, the chambers of commerce and businesses need to be involved. We need to get publicity out about what it is and get participation in what we're doing. And, last of all, we need to publicize the benefits of what we're doing. We need to get people enthused about the potential that's there. A lot of them are going to have a difficult time trying

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to figure out what it is we're going to do with this highway. If we've got a few benefits laid out for them, creative juices will flow.

Government and Military Strand Report

Reporter: Gary Mirich, IBM Corporation

Good afternoon. My pleasure to bring you the findings of the government and military strand. We were very happily facilitated by two people, Ben Froehlich and Jan Baltzer. We had fantastic communications and the two days have been very valuable.

We represented law enforcement, the computer industry, telecommunications industry, state government, county government, city government, and the like.

There were five key areas. Those areas were: 1) Cooperation; 2) Marketing; 3) Applications; 4) Public and private partnerships; and 5) Funding.

The first key issue identified was: 'Create an environment of cooperation and sharing by utilizing and expanding state government networks.' The thrust of this issue is cooperating with what we already have. Make better use of what's currently out there. The implementing organization should be all agencies with existing networks, all existing private networks, CIO council, and AEITC. Supporting mechanisms that need to be involved as well are standards bodies. The strand believes there is a need to establish a responsible, full-time person, agency or organization with a specific responsibility to create an office that will oversee all of the work that what groups like AEITC is doing. Staffing for that effort has got to be full-time. The timeline includes many variables. Timelines need to be coordinated with current activities such as AZTEL and GSPED. The next step we need to take in this area of cooperation is to have this committee continue to work together. It's getting in groups that work together under the auspices of a coordinating committee.

The second key area is the marketing area. Policy statement reads: 'Need to develop education and marketing programs and increase awareness and acceptance of government actions and technologies in order to improve public perception of government.' The 5 key issues, starting with cooperation, follow a logical pattern. Marketing could include these organizations such as AEITC, AZTEL, and all those mentioned previously. Every organization doing anything that will ensure success needs to be involved in it. Funding is very important.

Supporting mechanisms: Develop a common marketing plan. This goes back to cooperation. Create and orchestrate a message delivery system to get the message out. Timelines depend on what the orchestrated plan is and what it does. We strongly felt that champions push this in the legislature.

The third key issue is applications. We're all coming back to this and Senator McCain was solid on that as well. 'Identify business goals, customers, and services needed to meet these needs. This will establish requirements for applications and the technology to support the enterprise.' We all believe that it begins at the application. Technology for the sake of technology will not work, costs everybody money, and provides no results. The implementing organizations are all government agencies and chambers of commerce. Wherever we can get strength and support, we need to do that.

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Supporting mechanisms: We need to develop a way for organizational planning groups to share activities. We need to know and understand successful strategies and programs from other states, cities, and countries. We need to get that information into one single source. We shouldn't have to reinvent the wheel. Customer surveys are another way to touch the end-user and find out exactly what they want.

Public and private partnerships, another one of Senator McCain's points was brought on rather strongly. The fourth key issue: Public and private partnerships are recommended to develop and to cost effective, technically sound, and far reaching information technology solutions that are necessary to meet tomorrow's information needs. Implementing organizations are the same, once again. There needs to be discussions about how we will do business differently and educational institutions as well.

Supporting mechanisms: We believe the legislature needs to be a big piece of this. We need to define partnerships and document how good partnerships can work. We would like to know what has been successful before. The timeline is dependent upon beginning partnership discussions as soon as the applications assessment is completed. Next steps: we would like to see some joint inter-agency and industry technical evaluation groups established.

The final key issue is: To secure adequate funding for federal, state, local, and private sources sufficient to support public access to governmental and educational systems through the best available technologies. The area we emphasized was the Legislature. Of all these issues tied together, finding what applications have been successful, getting the partnerships together to move information to the stakeholders to drive demand to get the legislators on our side.

Supporting mechanisms: We just need to figure out how to eliminate competing and conflicting activities. We need to develop "one voice" to the people, to the public, who will ultimately pay for the services and systems. Statute change needs to follow that. If we could combine all of the budgets, all of the operating budgets for communications from city, county, and state, into one budget, everybody would agree that we would get to where we're going much sooner. Could that be done right now? Under current laws, maybe not. That's something at least worth looking at.

The timeframe is going to be heavily dependent on this consolidated plan and identifying and educating the legislators who we hope will be our champions. Evaluation and next steps must focus on outcomes. The funding will renew itself. The funding will be available if, when the funding is provided and the applications are installed, there's enough benefit and enough cost savings for efficiencies to warrant continued funding. We want to very much focus on outcomes.

Finally, and this is when I mention the lottery. We hope the lottery will come up with a new lottery game focusing on telecommunications. Not only would it be extremely popular, but it would yield very large results. With that, I end my comments. I appreciate it.

Community Organizations Strand Report

Reporter: Ann Bouwense, Arizona State University

The Community Organizations Strand was quite a mixture of folks. There were educators from universities, colleges, and K-12, librarians, telecom representatives from ASU and a community service organization, and the Telecommunications Association. We defined

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ourselves as those in the community who are providing a service, whether it be schools providing education and utilizing services or, each of us as part of the general public wanting more access and knowledge to technology and available information. We came up with approximately 18 different areas to address. We narrowed them down to five. We addressed these from the perspective of the general public or the lay person. We ended up with three final issues.

Equitable access was a focal point. Issues were: Who needs access? Who has the right to this access? Are there any barriers with this access?

The first key issue is: Define the minimum universal service standard. What is minimum universal service? We should look at what has already been established in other states, in other information networks already in place and then create something that will meet our needs and fit into what is already in place.

We recommendation AEITC conduct a workshop to educate and inform the Corporation Commission about issues related to minimum universal service and legal issues and regulations. Decisions made by the Corporation Commission, with respect to regulations, impact a great deal a lot of the things that we attempt to do or may attempt to do in the future. The Corporation Commission really does want to hear from us. They want to know what we're doing, not necessarily to regulate us or to create more problems for us, but to help us through and be an informed governing body. We want to provide issues in accessibility and in prospective communities, education and business groups. AEITC should conduct workshops, seminars, groups of this type, and the symposium. These are very excellent ways to do this.

Partnerships with AEITC and other important groups, whether they're user groups, business groups, additional governmental groups, AZTEL 2000, GSPED. All of these need to partner together and address the public policy, the forums, and the access issues.

We discussed education at great length. Standards information, connectivity, and information overload are critical issues. We developed several objectives. The most important is: 1) Promote life long learning in and with information technology. In addition to that: 2) promote user self knowledge and confidence through the technology that we have available; 3) create independent users of the network; and 4) promote technology in the curriculum and the integrity of the curriculum in technology.

Recommendation: Set up timely teleconferencing events, meetings and workshops, and other formats. Continually inform ourselves, our users, local government officials, decision makers, and partnering leaders to the needs of the public access. We recommend that this symposium be repeated again next year.

The last issue that we came up with was coordination. Who's going to take responsibility for all this? Who will be the driving forces that are going to be behind all of this? And, what's the ultimate goal of this coordination effort or person or group?

Requirement: Provide one statewide organization which will develop a tec ology plan which clearly defines areas of responsibility from whom we could access minimum universal standards.

Recommendation: Here, again, we call on AEITC to coordinate a meeting with groups such as AZTEL 2000 and GSPED and other strategically involved organizations. AEITC should coordinate the roles for the development of a statewide technology plan.

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These are, by far, not the only recommendations that came out of this community organizations strand. We did not get to timelines. And, maybe we did that on purpose without realizing it, because the timeline is now and forever. Yes, there are areas we need to set goals to achieve, but once we reach that goal, we need to have another goal. And in so doing, it becomes an infinite process and infinite responsibility to and for all of us. Thank you.

Question, Answers, and Comments

Mr. Ed Groenhout: Now would be a good opportunity for us to stand and give a standing ovation to Darel and Brian and Gary and Ann for doing what they did. Our final activity is basically the last three words in the program, 'debate, consensus, and adoption'. We have a series of issues from four different groups, some of which overlapped and some of which don't quite do that. This is the opportunity for debate for any of you who have any questions or want to make any statements relative to what you have seen, this is the time to do it.

Question from audience: In your report, I didn't hear a word about education and training?

In one of the groups that was an issue - in our education committee. To identify, recommend, and revise allocations of education and training that would use communications. We kind of got garbled in our minutes and so forth. But the fact is that was our second issue to look at the aspects of how communication can be used to support education and training. We took it a little bit beyond just K through 12 or K through 20, but talked about the entire citizenry and for that speaks to that, specific part of that in terms of training. Clearly, that was a major issue that has been considered. The emphasis in terms of discussion didn't revolve around the existing structure system and so forth that we can take advantage of but clearly there was intention to serve available resources to look at programs outside of the state as well as inside the state. The thought didn't get developed very fully in terms of a particular area but the fact is that that clearly is a very important issue that the idea of having the infrastructure in place to support education and training needs of the state. If we would have spent a little more time wordsmithing, I'm sure it would have been a little more clear.

Ann Bouwense: "The Telecommunications Association is a professional and user group with the directive to educate other telecommunications professionals, to better community and industry and other people interested in the profession. I have the privilege and the honor to be ASU's representative to that association. ASU is the member and I have the privilege, along with Dale and other people from ASU, to be a part of that group. There are various members in attendance from that group today in this symposium from other areas, education, business and industry, as well as, government and military.

Comment from the audience: I would just add that the TCA, as Ann said, is a professional organization we attempt to lobby. We attempt to have some impact on US West rate cases for example. It also shares experiences and stay abreast of current trends in the industry.

Kathryn Kilroy: "I just want to say that both organizations have met with each other. We have TCA come to us and tell us about them and vice versa. And we became a member of their organization, and we're hoping they become a member of ours."

Comment from the audience: Is part of the deliberations from the government strand, we did take the liberty of in fact of enumerating some 7 public policy issues that we thought provided a framework for our recommendations. One of my personal envisions for this symposium is for

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us to come forward with public policy issues calling attention to the issues in a format that gets the attention of our legislature and our elected leadership because that's where really, I think, we're going to start to make differences.

The seven policy issues that were just mentioned there: 1) the government responsibility to educate children to a certain standard; 2) government must maintain funding for education sufficient to meet the changing needs; 3) no new legislation without supportive funding; 4) ... all resources that are known, human, technology, and dollar resources.... resources, demand resource leveraging; 5) fiscal reward and support should be based upon cooperative ventures and public/private partnerships; 6) (end side of tape); 7) people have a fundamental right to access this information on and for themselves from their governments using the best available technologies. Did that help?

Comment from the audience: The reason I brought it up is because I hope that this will help shape deliberations on the record today that came forward from all strands. And that they carry forward and come out with discussion that goes to the Governor, that goes to legislators because public policy issues are what sets us apart from folks gathered together just making recommendations, firing at random. They are focused on issues which confront the entire state and why they are public policy issues.

Ed Groenhout: Do you have a suggestion as to how that might be accomplished?

I think you were inquisitive in what's proposed in symposiums that we have proceedings that are public. That if those public policy issues and others get themselves to the group, we identify them and under that, well, there is a framework, we then have recommendations and objectives which address those public policy issues and suggested outcomes that we feel are important to advancing goals and admission of informational and informational technologies .

I think what we need to do here is take what we have produced and meld it now. Janelle, you're coming out with a report? I would suggest that you choose some quotes from each of the strands, put together that final report and break out those that push legislative initiatives.

Janelle O'Dell: That's a very good suggestion. Obviously, there's a lot of writing to be done. All of the information that we've generated on your original papers will not go away. We now hold that whole body of information. We brought over 20 items, but there are probably 200 that we have on logs and computers.

Comment from audience: Ms. Janelle, it's a matter of trust. We have certain issues out there that are unbelievably bad and if we don't start trusting one another, that understanding that we all have the same goal, we aren't going to get there.

Comment from audience: A word about applications. I'm a little concerned that we obviously have to talk about applications to a degree, give examples that will allow people to understand and benefit from what we're doing. I'm a little concerned that if we get bogged down with everybody coming up with all the applications and every group we could possibly think of and process what we have down. I'm sure when they decided to put the transcontinental railroad through, they didn't sit down and think of every possible application for what was going to be carried on the train across the country. They came up with examples to serve and illustrate the point of why they

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needed it. We're designing a system from now to way past the 20th century or maybe the next 30 of 40 years. We can't possibly imagine who will use it. We have to design a system that will be there and incorporate it, in what our group has called it, in a living design. That is, it is capable of expanding if we want. I worry about getting bogged down with too many details that will keep from going forward at the speed that everybody wants.

Janelle O'Dell: I actually made most of my closing comments today. I thank John Badal for bringing up my last points, which are 'Where do we go from here?' and 'How we do that?' I strongly encourage you not to fall into what David (Snider) spoke about this morning. We've got to keep going. We've gotten a really good start. GSPED has got a really good start. We've got to keep it going and now we've got to implement. I would invite each and every one of you to contact me individually or any of the AEITC Board of Directors or any of the Operating Committee with any suggestions, comments, recommendations for how we do that.

My recommendation for doing the 'White Paper' is that if any of you have a sincere interest in devoting quite a bit of your time over the next four weeks, my thought is that I would like to have this to the printers on November 4th. I've already pre-scheduled meetings for my staff and for others to begin that process. That is a tight month. It's not a magic month, there's no end to it. I was kind of hoping we would have something out by the time the Vice President is here, what we think will be the second week of November. Now that's the time frame. It doesn't have to stay permanent. I think it's an important timeline and we keep targeting where we're going.

The 'White Paper' will include the proceedings to the extent that we could produce those as you've noticed, we're operating off of audio tape so I need to get all of those transcribed to the extent that they are solid audio tapes, we'll have those. All of our speakers, I hope, will submit their speeches to us, either in an outline form or as the specifics of what they said to us. The third piece, I believe I had spoken to some of you that we thought it would be the technology petition, as I said, that is no longer in existence, but I remind you that you will be getting that in fairly short order through AZTEL 2000. And I'll be working with that group to make that happen and make sure you all are informed and get to participate in that assessment.

So where we go from here is to keep working real hard and to make an honest effort to cooperate, to trust, and what I offer to you, on behalf of AEITC, is a place for you to come and trust. Yes, it was started by education and yes to a certain extent, when you start any new operation and you begin to open the doors to somebody else, you still have a little tug that you would like to have your issues at the top. But AEITC realizes that there are so many good issues out there and we think we have a lot to offer, so I invite you to participate in whatever way you wish, whether it's the 'White Paper' or membership. There's a lot to be done, and we're going to try to do a lot of good work on your behalf.

I want to thank one person who I did not thank today personally, she has made this process immensely easy for me and my staff. She's a true professional, and in every setting I'm in, her name is always raised with the highest admiration. She has a staff that is not at my beck and call, certainly, but was with me every step of the way as we prepared for this conference. I would be remiss if I didn't thank the Department of Education and Kathryn Kilroy personally for her contributions to the success of this event.

I would like for us to close by considering that in the spring we may come back together or before. And your willingness to continue to participate is very important. I promise that I

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won't ever bring you together for a purpose that doesn't have a specific outcome and something you haven't addressed here at this symposium. I will be in contact with each and every one of you in some way or another. Please be in contact with me.

The 'White Paper' will be out as soon as we can get it out. We will make an effort to internalize every one of your comments to us personally, that is to AEITC. In addition to that, we're going to be in constant contact with AZTEL 2000, with GSPED, with ASPIN, with any other players that are contributing to the whole. Thank you very much for being here and please send me your business cards and let's keep moving this thing forward into the 21st century. Goodbye.

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APPENDIX E

SUPPORTING DOCUMENTS

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STATE PLAN
FOR A
TECHNOLOGY INTEGRATED EDUCATIONAL DELIVERY SYSTEM
(TIEDS)

There are a variety of compelling reasons which support the adoption and implementation of this state plan for a "Technology Integrated Educational Delivery System" (TIEDS). These reasons include social and economic forces in the state and nation, legislative mandates, State Board actions, and the call from C. Diane Bishop, State Superintendent of Public Instruction, to fundamentally restructure our education system.

I. Rationale

Education is a major factor in productivity growth, even more so than increased capital or better use of resources. This education, however, must be responsive to the world of today. Much of the current educational environment resembles schools of the 19th century. We cannot continue to function in this manner nor can we continue to do business as we have in the past.

As a state we are increasingly locked in competition with other states and with other countries from around the world. This competitiveness will be heightened in 1992 when the European community sets in motion its internal market program. This will remove all physical, fiscal and technical barriers to trade between the 12 member countries and 320 million consumers. It remains to be seen what economic effect recent events in Warsaw Pact countries, the Soviet Union and South Africa will have on the United States.

We are faced with the challenge and opportunity to create a new vision of learning, a vision which transforms all dimensions of schooling. The ultimate success determinant in realizing that vision will be a demonstrated change in the cognitive and social environments of our schools which clearly supports meaningful learning. This change in the environment will be visibly supported by changes in the physical environment and the administrative and organizational structure of our schools and classrooms. That vision must recognize:

- changing classroom and workforce demographics,
- the globalization of the economy,
- changing workforce knowledge and skill requirements,
- the promise technology offers to educational reform and restructuring,
- the deficit of under-education.

A. Changing Classroom and Workforce Demographics

Arizona is embarking on a significant statewide effort to improve the state's student assessment program. The Goals for Educational Excellence project, a joint project of the Legislature, the state Board of Education, and the Department of Education, has required an analysis of the state's curriculum, testing programs and reporting of student progress. The new assessment and reporting system developed on the basis of this analysis will aid schools, districts, state educators and policy makers in making schools more accountable for and responsive to student needs.

While progress has been made in terms of establishing higher curriculum standards for all students K-12 and in the developing of a comprehensive pupil assessment process, the problems of high dropout rates, functional illiteracy and gaps in achievement levels of students continue to persist. Nationally, demographers predict that the number of minorities in schools will increase and traditional family structures and support systems will continue to demise. "Students who are black or Hispanic, or who come from single-parent families consistently have performed worse in school than others. The average reading proficiency of black and Hispanic 17-year old students is roughly at the seventh (7th) grade level." (Images of Potential, p. 4). There are indications that these conditions will accelerate unless we take action now.

These achievement gaps are not new, but are more urgent because the percentage of students who are at risk - predominantly poor and minority children - represent an increasing share of both the school population and our future workforce. This is verified in the recent **Ed. STAT** report "The 'At Risk' Status of Arizona School Districts". The report states "...a growing number of students are identifiable as being 'at risk' of failing to achieve in school and, ultimately failing to graduate. Furthermore, with the growing sophistication of workplace skills and the increasing competition for available jobs, dropping out puts a young person 'at risk' throughout the rest of his or her adult life." (p. 1). The study reported that the limited English proficiency (LEP) and socioeconomic status (SES) indicators most affect the percentage of students scoring at or below the 25th percentile on standardized tests within a given district.

In the coming decade, eighty (80) percent of new entries in the workforce will be women, immigrants, or minorities. These groups traditionally have been disadvantaged due to a number of factors - discrimination, language limitations, poverty and other economic reasons. Because of this they face an almost insurmountable situation when they enter the workforce. One of four members of the class of 2000, now in second grade, is living in poverty. In Arizona alone there are approximately 8,500 homeless children. These individuals are valuable assets. We can ill afford to cast them aside.

B. Economic Competitiveness and Globalization

"One of the major issues facing the U. S. economy is productivity growth. The projections for the 1988-2000 period highlight it as a continuing concern. Productivity has grown much more slowly in the past 10 to 15 years than in earlier periods. This has had an important effect on the rate of growth of real Gross National Product (GNP) and real disposable income.

Not only does productivity growth have important implications for future increases in our standard of living, but it also is an integral factor in America's remaining competitive or, in some cases, regaining competitiveness. Foreign trade is projected to continue to be the fastest growing category of GNP. The development of worldwide markets for goods and services means that we must remain competitive to sell products abroad or even at home, particularly high-tech goods and services where we still have an advantage in many instances.

The prospects for productivity growth depend on many things - such as spending on research and development, spending on capital equipment, utilization of our productive capacity, and the cost of energy - **but, clearly, the education and training of the laborforce are important.** We can only remain competitive through the participation of highly skilled and highly educated workers. Consequently, the potential imbalance between the educational preparation of those entering the labor force and industry's requirements raises an important concern." (Kutsher p. 39).

C. Changing Workforce Knowledge and Skill Requirements

The needs of the work place are changing drastically and dramatically. Informational technologies have been an important and integral force in this change. These technologies have changed the way business is conducted throughout the world and play a key role in the economic fortunes of nations. Additionally, these technologies are largely instrumental in the enormous advances in medicine, transportation, architectural design, manufacturing, agriculture, science, banking, communications, space exploration, and on and on. There have been few instances of human endeavor which have not been impacted by technology. Employers in these fields are demanding more highly-skilled workers, with over 90 percent of all jobs requiring some retrieval, assessment, and distribution of information. High school dropouts who once could learn unskilled or semi-skilled jobs will find that those jobs no longer exist in the twenty-first century.

"The United States continues to lead the world in new job creation. In the last two decades, we have generated about 35 million new types of jobs, and experts predict that we will generate between 12 and 15 million additional jobs before the turn of the century. This sounds encouraging until one considers that 75 to 85 percent of these new jobs require

cognitive, not manual, skills as well as post-secondary education." (Images, p.4).

Arizona, alone, has chalked up a 120% manufacturing employment increase over the past decade. It has been notably aggressive and successful in attracting high-tech industries; nearly half of manufacturing employment is in this sector compared to 15% nationwide. Predictions are that nearly 150,000 additional manufacturing jobs will be created in Arizona between now and the year 2000. (Arizona Now, p. 15) Approximately "41% of the new jobs in coming years will have requirements ranked at the highest level of proficiency in language, reasoning and mathematical skills, compared with only 25% of existing jobs that demand the same level of ability." (Perelman, p. 15).

These changes in the technological base of America's and Arizona's society will alter the knowledge, skills and values we need to be capable workers and citizens. Evolving information technologies will transform the nature of work, and this transformation will, in turn, affect the design and content of the school curriculum. Because of these technological advances, schools must shift in response. Data processing and information systems will be replaced by sophisticated devices for knowledge creation, capture, transfer, and use. Personal computers, videorecorders, fiber optic networks, intelligent telephones, videotex, digital discs, laser optics will change how we conduct business and how teachers and students function in the learning environment. Given the nature of employment in Arizona, it is critical that public education ensure that the learning needs of society and the continued enhancement and growth of our economic competitiveness be served by the most productive means possible.

D. The Promise Technology Offers to Educational Reform and Restructuring

Of all the efforts of any society, the most important is the educating of its populace. As we move into the next decade, the ability to rapidly and easily exchange all forms of information is absolutely essential to the development of our economy and the quality of our educational system. The challenge that confronts Arizona today is that of finding ways to enhance the depth and efficiency of our educational system and information exchange. In a word, systemic change of the K-12 education system must become a reality.

Technology is central to this systemic change. It is a powerful education tool to empower learners and assist teachers and administrators. The education arena currently lacks the in-depth exploration and empirical data to prescribe how technology should be used. "However, we do know that technology supports a variety of learning styles, contexts and curricula. It has the potential to expand teaching and learning beyond the four walls of the classroom. Technology suggests multiple teaching/learning patterns, challenging educators to pursue creative alternatives to the traditional lecture/worksheet structure. **Specifically, technology has the potential to:**

- **address the issues of educational equity, adequacy, and effectiveness,**
- **focus on students' characteristics and individual learning styles, e.g. self-directed, integrative, and collaborative learning styles,**
- **create learning environments which extend beyond the walls of the school involving members of the community, experts and scholars, other students studying the same issue or problem,**
- **focus on students applying their knowledge in purposeful activities, e.g. providing assistance to the community, working with other students on global issues, rendering relevance, practicality and societal value to their education,**
- **create inter-disciplinary approaches to curriculum often involving some form of teaming of teachers from different subject areas,**
- **enhance higher teacher expectations and a belief that students are capable of solving complex problems,**
- **establish a belief in the importance of utilizing existing and emerging technologies and researching their full potential for supporting education and creating new knowledge,**
- **increase students' responsibility for their own learning and the learning of others,**
- **develop the application of a mixture of technologies to the teaching/learning**

situation which extends beyond the classroom computer,
- establish flexible use of facilities, time and human resources,
- create a sensitivity to the development, health and well-being of the whole learner rather than be limited to academic development. (Images of Potential, pp. 6 and 8)

While we recognize that technology has great potential for education, we must also recognize that there are limitations as well. Technology should not be used as an end in and of itself. Rather, technology should be used to achieve the goals of education. It should be viewed as a tool to support teaching and learning. Technology will not answer all of our problems, but it can play an important part.

E. The Cost of Under-Education

There is little debate that the cost of dropouts to society, personally, economically and socially is monumental. The 973,000 dropouts from the nation's high schools in 1981 will lose $228 billion in personal earnings over their lifetime, while society will lose $68.4 billion in taxes. Today it would take a dropout over 48 years working 365 days a year at $4.00 per hour to make up the difference in the average lifetime earnings between a high school dropout and a graduate. The decision to drop out of high school could cost that individual a total of $562,308.70.

During FY87, the actual level of non-capital spending per student amounted to $3,544 per student in Arizona. The cost to incarcerate a juvenile offender was approximately $25,000 to $30,000 per year. Of all those incarcerated in Arizona, approximately 85% have no high school diploma or equivalent.

On the other hand, the Committee for Economic Development found: "Every $1 spent on early prevention and intervention can save $4.74 in costs of remedial education, welfare, and crime further down the road. If we could raise the mean-tested skills of our nation's 19-23-year olds by one grade equivalent - a goal that would be considered within reach for any computer-assisted remediation program in the country in 50 hours - lifetime earnings would increase by 3.6% and the likelihood of births out of wedlock, welfare dependency, and arrests would decline by 6.5%, 5.2% and 6.2% respectively." (MDC, Inc., p.40).

Technology alone cannot decrease the dropout rate or solve the social ills related to under-education; single solutions do not exist for complex problems. Nevertheless, as a component in a broad effort to address these issues, **it can play a critical role by:**

- **providing all students with an equitable, adequate and quality education,**
- **improving the efficiency of the educational system,**
- **increasing the productivity of teachers and administrators,**
- **meeting the continuuous educational needs of adults in literacy, the basic skills, job training and retraining, career and personal development.**

II. Issues and Concerns

A. Quality Education

The mission of the Arizona Department of Education is to oversee the provision of the best possible education for the Arizona public school students within the philosophical and fiscal mandates set by the Arizona Legislature and the State Board of Education. The strategic plan to accomplish this mission is embodied in the Educational Excellence in Arizona legislation Senate Bill 1442. The plan embraces several guiding principles, including:

- *equity* - financial equity and equal access,
- *accountability* - a system of standards and evaluation,
- *efficiency* - cost effective use of tax funds,
- *sufficiency* - an appropriate level of funding to meet educational goals,
- *balance* - between the value of both local control and the need for statewide standards.

These principles must not be simple platitudes but must be the very foundation for Educational Excellence in Arizona. Technology can serve as the mortar of that foundation.

Arizona's future well-being demands that we effectively educate all students and establish high expectations for their performance. From elementary school through high school and into higher education and job training, Arizona's young people of all backgrounds and abilities must be inspired to do their best. To this end, Arizona has established the following measurable goals:

- *individual student achievement* - to demonstrate mastery in mathematics, communications skills, science, social and economic studies, humanities and art, physical and health education, and to acquire broad employability skills and vocational/technical knowledge,
- *high school graduation rates* - to dramatically reduce the current drop-out rate of approximately one in three students who fail to graduate,
- *post-high school employment and college enrollment* - to ensure that high school graduates have the prerequisites skills necessary for success in higher education and in the workforce.

B. Equity

Equity for all Arizona's students demands that:

- every student should be able to receive quality instruction in every required course and in any additional appropriate course; the instruction should be effective and adequate, and coursework available in the state to one student should be available to all students,
- every student should have access to the data and primary resources that will empower him or her to accomplish his or her optimal level of achievement; the resources and information available to one student in the state should be available to all students.

Access to Instruction is Inequitable

State Board of Education rules for curriculum require instruction in specific content areas. For small, rural, isolated schools as well as urban isolated and urban declining enrollment schools, these requirements may present a burden and a challenge. These conditions often result in an inability to offer certain courses due to:

- lack of qualified teachers,
- inability to pay for qualified teachers,
- inadequate facilities and educational services and resources,
- insufficient numbers of students to warrant the required expenditure.

These conditions also contribute to:

- limited staffing,
- inflexible and narrow programming,
- few opportunities for program enrichment offerings for the gifted and talented,
- few opportunities for remediation.

These, along with inequities in the financial base of less wealthy school districts, make the delivery and access of balanced and quality education both costly and difficult.

Over the next ten years, these conditions will be exacerbated in Arizona. A recent study by Raymond I. Castillo, Director of Student Affairs, College of Education, Arizona State University, on Teacher Supply and Demand In Arizona indicates that the number of student teachers from all of the state recognized teacher preparation universities is in serious short fall of the state's demand. Specifically, the projected fall 1989 openings totaled 2,844. There was a total of 1,750 first year teachers available from the state's teacher preparation universities to fill these projected openings. These shortfalls showed up across the board including shortfalls in all of the content areas as well as in special education and elementary education. The new elementary foreign language requirement will solidify the need to

address the problem of the shortage of qualified education professionals.

Technology can address these burdens and challenges. Through the integration of technology into instructional strategies such as distance learning, computer conferencing, and electronic bulletin boards, all students can have the same educational opportunities. Through the use of facsimile machines, telephones, computers, modems and satellite or microwave receivers, educational opportunities are boundless.

Access to Information Is Inequitable

Information and the knowledge and wisdom that derive from it are the substance and the goal of education. Increasingly, information is the substance of the economy as well. By any measure, the United States is now an Information Society.

- At least 54 percent of the American workforce is composed of information workers.
- 63 percent of all equivalent working days in the United States are devoted to information work.
- Even non-information workers spend one-quarter of their time in information activities, while virtually none of information workers' time is spent handling goods or materials.
- Information work accounts for 67 percent of all labor costs in the United States because information workers receive wages and benefits that are 35 percent higher than those of noninformation workers.
- 70 percent of all work hours in the United States are devoted to information work because information workers put in an average of 10 to 20 percent more hours per week than do those engaged in other occupations. (Strassmann, "Information Payoff; The Transformation of Work in the Electronic Age". 1985, p. 56; cited in Rogers, p. 12).

In Workforce 2000, a study for the U. S. Labor Department, William Johnson and Arnold Parker, of the Hudson Institute, found that both the educational and skill requirements of U. S. jobs are rapidly increasing. According to their analysis, 41% of the new jobs in coming years will have requirements ranked at the highest levels of proficiency in language, reasoning, and mathematical skills, compared with only 24% of existing jobs that demand the same level of ability. Anthony Carnevale, of the American Society for Training and Development, found that in addition to the traditional three "R's", American business now considers six other groups of basic skills to be essential for any kind of employment in the 1990's and beyond. These other skills are knowing how to learn, listening and oral communication, creative thinking and problem solving, personal management, and organizational effectiveness and leadership.

To deny Arizona's students access to information is to deny them their futures. Information is, indeed, power. It is the wealth of society and of its people. Failure to provide our students access to all sources of information is to confine them to a future without prospect.

Traditionally, information for students has been contained within textbooks, teacher presentations and libraries. Today, through on-line data bases, computer search and retrieval, electronic bulletin boards, compact disc-read only memory (CD-ROM), teleconferencing, distance learning, etc., information is widely available from many sources. It is a commodity that must be planned for, acquired, and dynamically maintained.

It is imperative that Arizona secure the future for its students by providing them access to information. Our students must have the opportunity to develop the knowledge and competencies required to succeed, to be productive and contributing members of our society and to experience quality life.

C. Accountability

Arizona's goals for Educational Excellence recognizes several elements essential to the development of accountability:

Assessment

- a broad-based data collection system of statewide educational performance indicators,
- a comprehensive assessment of student achievement, including both norm-referenced testing designed to provide national comparisons of a student's performance and criterion-referenced testing to provide specific information on a student's mastery of a given topic,
- the implementation of specific standards for grade level promotion and high school graduation,
- a system of local assessment, whereby each school board sets specific district standards of achievement and develops accountability measures based upon state goals,
- a system of accountability for school personnel, in which additional compensation is based in part upon student achievement performance.

Fiscal and Performance Accountability

- external fiscal management and performance audits to measure the achievement of program objectives in a cost-effective manner,
- joint utilization of personnel, services, and equipment to promote cost-effective use of resources and equal access to programs (e.g., multi-district vo-tech programs, special education, and telecommunications services),
- provision of incentives for consolidation of school districts.

System Accountability

- development of a system in which **all** educational levels - K through 12, community college, and university - coordinate their actions and facilitate the transition from one level to another.

In addition to their core teaching duties, teachers are expected to diagnose learning styles and rates of learning, measure acquisition of essential elements and track student achievement, maintain discipline records, and respond to a myriad of administrative details. Given these instructional and administrative requirements, all teachers (94 percent) agree that students need more help and support than they have needed in the past. Forty percent of teachers report "teaching" less than 75 percent of the time.

Administrators also report burdensome paperwork requirements because of the necessity to record and report financial and accounting information, student and personnel data, measurement results, and adherence to regulatory and legislative mandates.

Despite their importance for ensuring maintenance of records for accountability and student achievement, these tasks need not be burdensome. Through automation and rapid data transfer, technology-based management and expert systems can alleviate the tedium and time often associated with such reporting requirements. Relieving teachers of such labor-intensive record keeping allows them to concentrate on teaching; integrating technology into education will not necessarily save teachers time, but it will allow them to devote their working time to teaching. Relieving administrators of the need to monitor the collection and transmission of such data allows them to support the educational functions of schools.

Technology has enormous implications for accountability. Computerization of mundane activities such as student attendance, grades, enrollment and financial data increases productivity and provides more time to spend on the instructional process. The use of technology also increases the availability of educational services, resources and information and creates different communication pathways for teachers, students and administrators alike. Although the paperless office is certainly an illusion, a much larger volume of information can be kept and organized without the investment of more time using technology.

D. Productivity

The teaching/learning environment made possible by the use of technology can lead to increased productivity for students, teachers and administrators. As Heinich (1984) suggests, teachers should consider the use of technology in education not only as a set of products but as a way to discover the *process* of planning, developing, selecting, implementing and revising instruction. This process insures that curriculum and instructional alignment occur and that individualized educational plans become a reality.

Using today's technology, teachers can more effectively manage classroom activities, measure individual student and group progress against curriculum goals, and revise the instructional materials to meet those goals. Educational technologies are now available so that teachers can develop instructional materials and activities that used to be reserved for only the most sophisticated media specialist. These technological developments have enabled teachers to create materials capable of enhancing the student's capacity and desire to learn as well as the teacher's capacity and enthusiasm to teach.

In the majority of today's classrooms, information that is required for administrative, classroom management and instructional purposes is dealt with manually or at best with meager technological support. This environment and lack of technological support requires that the teacher spend valuable instructional and professional time in completing laborious clerical duties. The productivity level of both teacher and student is stymied by this situation.

In a technology integrated educational system, however, productivity will be greatly enhanced. Taking attendance will simply be a matter of students logging in at their computers. This information will be electronically transferred to the administrative office to be aggregated, sent to the district office where it will be aggregated with other schools data in the district and eventually electronically transmitted to the state level. Student assessment will become more diagnostic with the results being integrated into instructional activities so that teacher and student receive immediate feedback on student progress. Student records will reflect past performance as well as current accomplishments. These profiles will be able to be transmitted to whomever has the authority and/or responsibility to have this information. The "guessing game" of where to place a student, how to motivate and challenge him or her, and maximize the student's full potential will no longer exist.

Once all instructional, administrative and communication systems among schools, districts and the Arizona Department of Education are fully integrated, information will be available instantaneously to students, teachers, administrators providing them with the resources to improve their productivity.

III. Technology Facilitates Meeting the Needs

A. Technology Works

Considerable research and evaluation have been conducted on the effectiveness of computers in instruction and learning. While some of the hopes and speculations regarding the utility of technology in meeting educational needs have not yet been realized, technology far less powerful than that currently available has already amassed a proven record of significantly improving the quality and efficiency of education. Furthermore, as newly emerging and blueprint technologies described below supersede those on which research has been conducted, the positive effects are likely to increase.

1. Basic Skills Can be Acquired More Thoroughly and More Quickly With the Aid of Technology

The use of technology, along with many other solutions, shows promise of improving students' basic skills, reducing the amount of time needed to learn these skills, and improving students' attitudes toward school.

Computer assisted instruction (CAI) generally produces small but significant increases in achievement test scores. The improvement rate varies according to the grade range studied and the application, but, at a minimum, achievement increases from the 50th to the 60th percentile on such tests (Bangert-Drowns, et al, p. 65). Other analyses find improvements from the 50th to the 61st percentile (Kulik and Kulik, p. 224), to the 63rd percentile (Samson, et al, p. 313), and to the 68th percentile (Kulik, et al, p. 59).

Furthermore, according to some analyses, "Computer-based teaching had its clearest effects in studies of disadvantaged and low aptitude students. This analysis provides the strongest evidence yet available that the computer has an especially positive contribution to make in the education of disadvantaged high school students." (Bangert-Drowns, et al, p. 66)

This finding is substantiated by another analyses that states "Six reviews at various grade levels found that slow learners and under-achievers seemed to make greater gains with computer-based methods than more able students." (Roblyer, et al, p. 30). The authors caution that "Many of the studies which yielded high effects with slow learners were of systems *designed* for this population." (Roblyer, et al, p. 30). More recent analyses, however, have "...found no evidence of differences between students on the basis of ability levels." (Roblyer, et al, p. 54).

Other relevant results indicate that students learned their lessons with less instructional time, the average reduction being 32 percent and that students liked both their classes and computers more when computers were used in instruction. (Kulik and Kulik, p. 224). A general conclusion of these analyses states that CAI: (1) has real potential as a tool in improving student involvement in precollege classes; (2) fosters positive attitudes toward the computer; and (3) can produce substantial savings in instructional time. A safe conclusion is that the computer can be used to help learners become better readers, calculators, writers, and problem solvers. (Kulik, p. 1)

In addition, commercial learning centers have shown success in increasing literacy and in assisting potential and actual dropouts to acquire certificates of high school equivalency through a computer-based program. The Comprehensive Competencies Program, for instance, provides individualized instruction pursued on a self-paced basis with attainment measured and tracked on computer. The program also provides the ability to diagnose learning pathologies and prescribe remedies. Data indicates that learners have gained an average of 1.1 grades in reading in 31 hours of reading instruction and of 1.6 grades in mathematics in 28 hours of mathematics instruction. (Taggart, p. 28). Participants in Adult Basic Literacy Education (ABLE) have increased reading and mathematics skills by an average of one grade level for every 40-50 hours of computer-based instruction combined with tutoring. (Mendel, p. 30). Another technology-based program that offers hope to adolescents and adults hampered by a low reading level is Principles of the Alphabet Literacy System (PALS) which uses interactive videodisc. During one ten-week summer session, the reading level of ninth- and tenth-grade students in Florida who were identified as low readers and who met eligibility requirements established by the Job Training Partnership Act (JTPA) rose an average of three grade levels. (McGraw, p. 21)

As a result of these successes, a report on workforce literacy, produced by the Sunbelt Institute, recommends that "Computer-assisted instruction, interactive video disks, television, and other modern technologies, must be incorporated more fully into literacy and adult education programs." (Mendel, p. 33). Similarly, a report by the Adult Literacy and Technology Project concludes, "It is imperative...to find ways to make technology, and through the technology, literacy instruction, accessible to everyone. (Turner, p. 3)

2. Higher-Order Skills Can Be Improved With the Aid of Technology

The higher-order skills that will be needed to support the economy of the state and

the livelihood and welfare of the state's citizens can be significantly and demonstrably enhanced with the aid of technology. For instance, the average achievement level of junior high school general mathematics students on a standardized test of problem solving rose from the 33rd to the 68th percentile over four years of television instruction. (Chu and Schramm, p. 2) The Higher Order Thinking Skills (HOTS) Program developed by Dr. Stanley Pogrow of the University of Arizona shows gains in thinking skills and social interaction that continue beyond the experimental experience. In the HOTS program, commercially available software is used to develop in at-risk students the thinking skills of metacognition, inference, decontectualization, and synthesis. As conceived by Pogrow, the HOTS program "...is an alternative to Chapter I programs in grades three through six that replaces all compensatory content instruction and drill and practice with thinking skills activities." (Pogrow, p. I I).

Results of the program, as reported by Pogrow, indicate that, "...in addition to gains in thinking skills and social interaction, schools are generating gains exceeding 15 percentile points (reaching as high as 25 percentile points) on standardized tests the first year. Gains continue in the second year. Standardized math scores are also up substantially without specific math activities the first year. Indeed, HOTS students have been outperforming students in computerized drill and practice programs." (Pogrow, p. I I).

Pogrow emphasizes that it is not the computer alone which is responsible for these successes. The technology is a tool which must be used with the HOTS curriculum, teaching techniques employed by trained teachers, and instruction in the regular curriculum. He explains that "...the key to using computers to enhance learning in transferable ways is not the computers or programs themselves but the dialogue that ensues between teacher and students." (Pogrow, p. 13).

3. Technology Can Help Meet the Needs of Special Education Students

Special needs students, those with physical and mental handicaps, can in many cases be reached more effectively through technology than with only teacher-student contact. "Adaptive/assistive devices" can compensate for sensory communication, mobility, and manipulation deficits. Technological examples of such devices include braille writers and printers, speech synthesizers, reading machines, and eye movement detectors. Project A. I. (Activating Children Through Technology), for instance, integrates microcomputers with speech and music synthesizers, graphics tablets, and other devices, into educational programs for mildly to severely handicapped children to the age of eight years. **Preliminary results indicate that computer use increases attention span, retention, social interaction, and aspects of problem solving.** (Hutinger, p. 5)

A preliminary research project at the University of California at Los Angeles indicates that using speech synthesizers with adolescents with Down's syndrome increases the teenagers' speaking, reading, and writing abilities. Within 10 sessions, more than 80 percent of the students gained at least six months in mental age on at least one-half of the standard tests. (Kolata, p. I 5)

Videodisc technology for instruction and management developed at Utah State University has been shown to be effective in teaching some content, such as telling time, and skills, such as social interaction skills, with children with mild intellectual handicaps. (Hofmeister and Friedman. pp. 360-361)

Technologies can be effectively used to assist management and diagnosis of special needs students as well as to support their instruction. Several programs exist, for instance, that periodically list children due for Individualized Education Program (IEP) review and automatically report necessary data to state and other agencies. (Bennett, p. 107) Preliminary evaluations of expert systems to diagnose handicapped students as learning disabled indicate that the expert system's conclusions "...were comparable to those of the 'better' human experts and more acceptable than those of the majority of human experts." (Parry and Hofmeister, p. 131). Similar

studies of the use of expert systems to diagnose reading problems "...revealed that the expert system provided more detailed information than human diagnostic reports." (*Ibid.*, p. 130).

4. Distance Learning is a Viable Means for Providing Effective Instruction and Inservice

Distance learning refers to instruction and inservice that are delivered over a distance via telecommunications or other means, or on-site via technology, and is comprised of at least one of the following characteristics: (1) the instruction supplements or comprises entire course content; and/or (2) the instruction is available from an instructor in real time; and/or (3) the instruction is interactive with the instructor and/or with courseware and data available on student workstations.

Telecommunications- and computer-based technologies offer the ability to deliver instruction to districts where it is currently unavailable in order to meet the needs of equity and quality cited above. Such instruction by distance can be provided—and, to some extent, already is offered—through a variety of means. Most notably, Arizona School Services Through Educational Technology (ASSET) offers supplemental instruction through public broadcasting to 131 districts and approximately 276,164 students. The wide array of programming delivered by public broadcasting stations enriches and broadens students' knowledge and experiences and informs teachers as well. Approximately four (4) districts in Arizona also deliver supplemental instruction, teacher inservice, and other school services over local cable or broadcast networks.

In addition to the supplemental instruction that is provided by public broadcasting, course work for credit is also offered through videotape, audio conferencing, telecommunications and computer-based technologies, and through combinations of these at the University and Community College level. Distance learning courses for credit at the K-12 level in Arizona currently include providers from other states and national consortia. These current and/or potential providers include:

- Oklahoma State University, as a member of the Midlands Consortium Star Schools Project,
- The Satellite Educational Resources Consortium (SERC), which is composed of public television groups and state departments of education,
- TI-IN Network, Inc. a provider of student and staff development services,
- The Education Satellite Network sponsored by the Missouri School Boards Association,
- The Satellite Telecommunications Education Program (STEP) produced by Educational Service District 101, Spokane, Washington.

Many additional efforts in other states and at the national and regional levels provide access to education-related information electronically. These include:

- The Software Communication Service, a 13-state consortium that offers to schools and colleges an extensive array of services, such as software and video preview, product procurement assistance and delivery, inservice training, and on-site technical support,
- Learning Link, an 11-member national information system that features databases, information resources, inservice teacher training, message centers and electronic mail, and gateways to remote educational databases.

The Office of Technology Assessment states: "In most instances, distance learning appears to be as effective as on-site, face-to-face instruction in the classroom. Extensive research indicates that distance learning is equally effective in applications for adult learners in nontraditional programs and for training of professionals in business, industry, and the military. Distance learning has proven to be a powerful delivery system for many subjects and through many media. Although the evidence is incomplete in K-12 settings, much must be learned about instructional design, teaching techniques, and various kinds of interaction that affect learner outcomes.

Current distance learning efforts offer a rich source of data to be mined.

Distance learning affects the educational process in a number of ways. Students report having to take greater responsibility for their learning and that their experience helps them make the transition to higher education. Students also report that they benefit from exposure to a greater range of ideas, peers, and teachers made possible by the expanded educational community. At the same time, however, students report that distance learning is harder. When the distance learning group is large, students complain about difficulties in raising questions and obtaining help during class time.

Whether distance learning works equally well for all students is yet to be determined. Most applications to date have been with academically advanced high school students and independent adult learners - those who already possess strong study skills, high motivation, and discipline. Whether the medium of distance learning works as well with young or academically weak students - and under what conditions - needs further study.

Adult distance education is cost-effective when compared to traditional methods of instructional delivery, saving on travel and employee time. Experiences in adult learning and business and military applications have implications for teacher training and staff development. Few studies have examined cost effectiveness of K-12 projects. Where traditional instruction is simply not available, comparisons of the cost-effectiveness of distance education and traditional delivery is moot." (Linking for Learning: A New Course for Education, p. 11).

B. Emerging Technologies and Educational Practice Will Evolve

1. Technology Is Evolving

Technologies in use in schools today seem miraculous compared to those of just a decade ago. Those in use in the late 1990s will make those of the 1980s seem quaint.

Technologies in use in schools include:

- instructional television for supplemental instruction and inservice,
- computers for drill and practice, tutorials, simulations, programming, and problem solving exercises,
- electronic communications systems for educating geographically isolated students using one-way video signals, sometimes enhanced by two-way audio signals,
- communications networks for information and data exchange among education institutions,
- information utilities, which connect workstations to various information sources, such as radio, television, newspapers, journals, books, and magazines,
- teletext and videotext, which scan and retrieve information.

A broad current trend involves the synthesis of computers with telecommunications. The convergence and increased compatibility of many technologies is a current reality. In the future, the quality and capabilities of the technologies will increase, while costs are likely to decrease. Distance will no longer constrain the search for needed information. In practical terms, the new devices put the world of knowledge at the user's fingertips.

Emerging technologies offer enormous and unprecedented possibilities. Recent computer-related innovations greatly facilitate the entry, storage, and retrieval of very large amounts of information in multiple formats, including text, graphics, audio, and moving images. In the future, knowledge bases will be not only larger, but will be cross-referenced and linked to one another through public and other telecommunications networks, allowing users to browse through vast libraries of audio and video information.

Computer-based multimedia sometimes is referred to as "hypermedia". The technolo-

gies, in addition to the computer, that make multimedia possible are:

- CD-ROM, an optical storage device of immense capacity,
- the computer controlled interactive videodisc player.

Although the components above are the ones most likely to influence the delivery of education in the near future, other areas of research suggest additional long-term possibilities. These include:

- voice recognition and synthesis, which facilitate communication between the computer and the user,
- digitizing of print, audio, and video analog information, such as texts and videotapes,
- superconducting materials, which may greatly enhance the speed, memory, and efficiency of computers,
- vector and parallel processing, which use microprocessors to work simultaneously on different parts of a single large problem,
- expert systems and artificial intelligence, which emulate human higher-order reasoning abilities,
- neural networks, which allow machine learning and diagnosis of patterns and problems,
- vertical blanking interval (VBI) in television broadcast to deliver data simultaneously with the video/audio image.

As these technologies are developed and marketed, applications for education must be encouraged. Schools in 2000 must not be relying on the technologies of 1990; they must have access to and reason to use the technologies of 2000. Business, education, and government must work together to transform the technologies developed for the workplace and the military into those appropriate for the classroom. Such cooperative effort in regard to military schools' software is anticipated from the newly created Office of Technology Transfer within the U. S. Department of Education and other federal efforts. A product development consortium of business and education can move exciting training and applications technologies from the former to the latter. Furthermore, educators and taxpayers must be prepared to phase in new technologies and phase out or upgrade obsolete technologies on a cycle of approximately five years.

2. Education Will Evolve As Technology Is Implemented

The attributes that make the new technologies attractive for instruction and management also imply great social and organizational change in the education system. In the long run, the technologies promise to alter what is taught (curriculum), how it is taught (pedagogy), where it is taught (in schools, alternative educational settings, workplaces, homes, or elsewhere), when it is taught (during school hours, after school hours, weekends, or summers), and may induce debate on the whys of education (in terms of life skills, economic competitiveness, and personal enrichment). The extent of these changes has been described as a second frontier.

> Computing in education has a second frontier because an irreversible phenomenon of historic significance has been initiated that will deeply affect the potentialities and constraints of education. We can explore what lies beyond this frontier: we cannot return to a world in which the frontier does not exist. (McClintock, p. 349)

For technology to make a genuine contribution in education, it must be allowed to shape and be shaped by the school and classroom settings. Its effect will be minimal if it is simply "added on" to the existing curriculum. The relationship between education and technology must be holistic. Hardware alone cannot educate students. It remains for teachers, empowered by the technologies, to translate information into knowledge and wisdom on the part of the student; for students, similarly empowered, to formulate questions and to learn how to learn; and for administrators, also empowered by rapid data and information aggregation, to lead their institutions to ones characterized by diversity, efficiency, and achievement.

The two most common errors in technology planning assessment are to overestimate the speed of diffusion of an innovation and to underestimate its eventual consequences. (Dede, et al. p. 88) Integrating the new computing and communications technologies into education will require concerted effort. They will also provide teachers, students, and administrators with an array of rich alternatives to traditional teaching, learning, and managing.

Furthermore, while the emphasis of this plan is on the use of technology in school settings, technology will continue to have an impact on learning in the home and other settings. Television reaches over 90 percent of the homes in this country, and children and their parents have access to three major networks and public television. Nearly 50 percent of the homes in the country subscribe to cable television, providing an additional 20 to 150 channels for viewing. With this widespread coverage, it is possible to imagine a wide variety of information on parenting, careers, and other topics and courses offered both to adults and to students. This information could be broadcast as it is today; it could become interactive; it could be provided in the form of computer software and programs; and it could originate from a variety of sources.

a. Teaching Will Evolve

The technologies will bring the media laboratory and the library into each classroom. For the teacher, this combination will enable the authoring and presentation of lessons using materials drawn from multiple audiovisual sources. Currently, a single audiovisual presentation may require multiple, bulky pieces of equipment–film projector, slide projector, audio tape recorder, videocassette player, overhead projector, and screen. In contrast, **a teacher workstation that integrates the new technologies will make multimedia available to all teachers at all times.** The same is true of library resources, such as books and journals. Entire libraries of text, pictures, and even full-motion videos with sound will fit onto only a few optical disks.

The teacher's computer will be a super-workstation, capable not only of superior presentations to the class as a whole, but also monitoring student progress during individualized or small group sessions, thereby giving the teacher great flexibility in terms of instructional approach and classroom arrangement. The teacher's station will act as a file server that controls student access to a vast amount of software. The station also will assist the teacher with a myriad of administrative tasks, including attendance, lesson plan preparation, testing, grading, and report writing, thus freeing the teacher for planning and working with individual students.

In a student-centered classroom the teacher's role will be to enable students to assume greater responsibility for their own education. Teachers are more likely to facilitate learning, less likely to control it.

b. Learning Will Evolve

For the student, the technologies mean a variety of educational experiences ranging from directed interactive lessons to nondirected individual or cooperative exploration of diverse subjects. Directed lessons will use artificial intelligence or neural networks to diagnose and match the individual's unique learning style, providing feedback at appropriate intervals. Students will progress at their own pace, with some receiving intensive remedial assistance and others beginning advanced studies regardless of grade level. In general, students will learn more, faster.

In the long run, the new technologies could change assumptions about education. Under current practice, until test time, neither the teacher nor the students can be confident that students have acquired the knowledge or skills. With the new technologies, students and teachers can receive immediate feedback on a lesson's effectiveness. As a student works through an individualized lesson, he or she leaves an electronic "trail" that can be traced and

analyzed for information on how the student learns. The technologies may be the key that unlocks the mystery of how students learn. **Greater knowledge of student learning patterns, both individual and collective, promises to revolutionize the science of learning and the practice of teaching.**

c. Curricula Will Evolve

Changes in pedagogy and measurement, in the rates and methods by which students learn, and in the demands that will be placed on the citizenry and workforce of the future, suggest changes in curriculum as well. Some leaders urge a utilitarian curriculum that includes familiarity with computers for data searches, word processing, and other applications. (National Task Force on Educational Technology, p. 9) Others propose a "new literacy" that includes rhetoric to comply with voice recognition technologies (Compaine, pp. 156-59) or information analysis and evaluation, prediction and long-range planning, and aesthetics. (White, p. 7) The federal Office of Technology Assessment projects new job skills to include problem recognition and definition, handling of evidence, analytical skills, implementation skills, human relations, and learning skills. (U.S. Department of Labor, Office of Technology Assessment, 1988 p. 243) Former Secretary of Labor Marshall foresees a shift to higher-level skills, greater attention to language and international studies, and less concentration on textbooks. (Marshall, p. 54)

Regardless of the specific skills and knowledge which adults will need in the 21st century, the citizenry must be flexible as the world continues to change. Provisions for content and procedures in the curriculum must be similarly flexible. The Goals for Excellence and The Arizona Student Assessment Plan (ASAP) have laid the foundation for our response to these demands.

d. Management and Structure Will Evolve

For the administrator and other staff, **technologies offer communications within schools and districts, between schools and parents, and among education and other educational entities across the state.** The needs of students and families can be more productively met. **Records of mobile students can travel with them rather than behind them. Students at risk need not be lost.** Educational leadership can be thorough and consistent as local and state policymakers share information and guidance.

Developments might include alterations in the roles and relationships between instructional and administrative staff who will share technology hardware and networks to conduct their tasks. Governance of schools is likely to evolve.

e. Facilities Will Evolve

As electronic networks become wired and structural relationships within schools evolve, so will the buildings themselves. **The architecture that conveys the transmissions and houses the new teaching, learning, and managing must be planned for long-term flexibility and change.**

IV. The Vision - A Technology Integrated Educational Delivery System

Arizona's education system must have the ability and capacity to use and apply technology to the teaching and learning process. The following statewide plan for a multi-level technology integrated educational delivery system (TIEDS) plots a course to meet the multi-faceted needs of all learners from K-12, higher education, business, family and community. The system provides for:

- an equitable, adequate and quality education,
- an efficient and accountable education system,
- an increase in the productivity of teachers and administrators,
- a continual response to the educational needs of adults in literacy, the basic skills, job training and retraining, career and personal development.

Implementation of TIEDS will be accomplished in conjunction with the Arizona Educational Telecommunications Cooperative (AETC), which is currently developing a state-wide master plan for telecommunications network in Arizona.

It is anticipated that the network will provide the following services to participating members:

- delivery of instructional programming for the K-12 audience, both students and educational personnel,
- delivery of post-secondary instructional programming to university and community college level students, especially those in remote areas and at off-campus centers,
- delivery of instructional programming for adult basic education and General Education Development (GED) preparation for individuals in Arizona,
- delivery of instructional programming for continuing education or Arizona's workforce in education, business and industry, professional and government agencies,
- the provision of video teleconferencing for state and local agencies thus diminishing travel requirements,
- electronic transmittal of files and reports, electronic mail and electronic bulletin boards,
- access to an information-rich environment through on-line computerized catalogs, inter-library loan, reference referral, and other library/media services,
- access to computerized test banks for K-12 teachers statewide to help assure greater consistency in competency testing in both academic and occupational programs and,
- exchange of information, courses and programs between and among public educational institutions through various means including data and audio teleconferencing.

DESCRIPTIONS OF FUNCTIONAL WORKSTATIONS/CENTERS

The needs and status of the use of technology in districts and schools will continue to vary. This undirected proliferation of educational technology could increase the polarization of educational opportunity in the state, allow inefficient allocation of scarce resources, and impose economic burdens on our schools.

Therefore, it is suggested that common objectives and requirements for the use of technology in the teaching and learning environment be adopted to ensure total system compatibility within the state. These elements are displayed in the following charts and graphic descriptions.